

Washington State Elk Herd Plan

Draft

NORTH RAINIER ELK HERD

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TABLE OF CONTENTS

Acknowledgments	iv
Executive Summary	v
Introduction	1
Area Description	1
Location	1
Ownership	1
Topography	2
Vegetation	2
Historical Distribution/Population Level	3
Historical Population	3
Current Distribution and Population Level	4
Proposed Distribution	5
Genetic Considerations	5
Herd Management	6
Herd History, Current Status, and Management Activities	6
Estimated Population Size	6
Herd Composition	11
Mortality Assessment	12
Tribal Hunting Harvest	17
Nutrition	18
Natural Predators	18
Other Mortality Sources	18
Social and Economic Values	19
Hunting	19
Hunter Numbers	20
Harvest Strategies	20
Damage	21
Watchable Wildlife Values	22
Habitat Management	22
Current Condition and Trend in Habitat	22
Roads and Road Management	24
Research- Past Research Conducted and Present Needs	25
Population and Mortality Studies	25
Habitat Assessment	25

Research Needs	25
Herd Management Goals	25
Management - Objectives, Problems and Strategies	26
Herd Management	26
Habitat Management	28
Herd Augmentation (GMU 485 - Green River)	29
Background and Justification	29
Objective	30
Release Site Description	30
Elk Capture and Transplanting	32
Monitoring of Released Elk	33
Discussion	34
Timeline	35
Spending Priorities	35
Population Estimation (mark recapture surveys)	35
Pre and Post Hunting Season Herd Composition Surveys	36
Monitor Recreational and Tribal Harvest	36
Habitat Enhancement on Primary Summer and Winter Range	36
Elk Augmentation to the North Rainier Herd Area	36
Herd Plan Review and Amendment	36
Literature Cited	37
APPENDIX A North Rainier Elk Herd Location in Western Washington	39
APPENDIX B The North Rainier Elk Herd Area	40
APPENDIX C North Rainier Elk Herd Distribution	41
APPENDIX D GMU 485 (Green River) Harvest Quota Distribution and Permit Type	42
APPENDIX E Reported Tribal Harvest From the North Rainier Herd Area	43
APPENDIX F Elk Hunting Season's in the North Rainier Herd Area	44
APPENDIX G Management Authority and Strategies For Controlling Elk Damage	51
APPENDIX H RMEF Funded Projects in the North Rainier Elk Herd Area	55

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NORTH RAINIER ELK HERD PLAN

Executive Summary

The North Rainier Elk Herd is one of ten herds identified in the State. The elk herd range is north of Mt. Rainier, including Pierce and King counties. The core elk distribution is on the western slopes of the Cascade Mountain Range. Small satellite populations occur on the foothills and pockets of habitat near urban and suburban developments. It is an important resource that provides significant recreational, subsistence, cultural, aesthetic and economic benefits to Washington citizens and valued cultural, subsistence, and ceremonial resource to the Native American people of the area.

The purpose of this plan is to provide direction for the management of the North Rainier elk resource into the future. This is a five-year plan subject to amendment. Before the fifth year, this plan should be updated, reevaluated, amended and implemented for another 5-year period. It will be a valuable reference document and guideline for WDFW, Tribes, agency cooperators, landowners and the general public. Priority management activities can be implemented as funding and resources become available.

There are three primary goals stated in the North Rainier Elk Herd Plan: (1) to manage the elk herd for a sustained yield; (2) to manage elk for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography; and (3) to preserve, protect, perpetuate, manage and enhance elk and their habitats to ensure healthy, productive populations.

Specific elk herd and habitat management, objectives, problems and strategies have been stated in the plan. These are priority objectives identified to address specific problems in elk management. To accomplish each objective a variety of strategies have been developed. The following objectives have been identified:

- Improve collection of an accurate scientific database to manage elk populations.
- Increase elk population numbers in the following units:
 - GMU 460 (Snoqualmie), from 125 to 500 elk
 - GMU 485 (Green River), from 150 to 500 elk
 - GMU 653 (White River), from 600 to 900 elk, with fall index flights in MRNP approaching 600-700 elk.
- Manage the North Rainier elk herd to ensure harvest does not exceed recruitment rates.
- Promote and recognize viewing and photographic opportunities provided by this elk herd.
- Increase and improve habitat to allow elk to reach population objectives in the North Rainier Herd Plan.
- Develop partnership opportunities to increase availability and improve quantity and

quality of elk habitat on important sites.

Spending priorities have been identified for the next five years. Achieving spending levels will be contingent upon availability of funds and creation of partnerships. The recommended priority expenditures for the North Rainier elk herd are as follows:

<u>Spending Priorities</u>	<u>1st year</u>	<u>5 years</u>
● Population estimation (mark recapture surveys at 3-5 year intervals) Cost-share with Tribes.	\$17,600.00	\$52,800.00
● Herd composition surveys (cost-share with Tribes).	\$11,500.00	\$57,500.00
● Monitor recreational and tribal harvest and collect age data (tooth cementum annuli).	\$10,000.00	\$50,000.00
● Habitat enhancement on primary winter and summer ranges.	\$10,000.00	\$50,000.00
● Elk augmentation to the North Rainier herd area.	<u>\$48,400.00</u>	<u>\$96,800.00</u>
Total	\$97,500.00	\$307,100.00

NORTH RAINIER ELK HERD PLAN

I Introduction

The herd plan is a step-down planning document under the umbrella of the Washington State Management Plan for Elk (McCall, 1997) and the Environmental Impact Statement for Elk Management (McCall, 1996). For management and administrative purposes the State has been divided into numerous Game Management Units (GMUs). A group of GMUs is described as a Population Management Unit (PMU). The North Rainier elk herd is one of 10 herds designated in Washington (Appendix A). In this context an elk herd is defined as a population within a recognized boundary as described by a combination of GMUs.

The North Rainier Elk Herd Plan is a five-year planning document subject to annual review and amendment. Once approved the plan will remain in effect, as amended or until canceled. The Washington Department of Fish and Wildlife (WDFW) recognizes the sovereign status of federally recognized treaty tribes and the right to implement their own hunting regulations. This document recognizes a responsibility of the WDFW to cooperate and collaborate with the Point Elliott and Medicine Creek Treaty Tribes. It also recognizes the pivotal role of private land owners and public land management agencies, notably the U.S. Forest Service (USFS), National Park Service (NPS), Washington Department of Natural Resources (DNR) in elk management.

II Area Description

- A. Location:** The North Rainier elk herd range encompasses approximately _____ of habitat contained within King and Pierce counties. This elk herd includes PMUs 44, 47, and 48, and has the following GMUs: 460 (Snoqualmie), 466 (Stampede), 485 (Green River), 490 (Cedar River), 653 (White River), and 654 (Mashel), which is the core herd area, (Appendix B). GMUs 454 (Issaquah) and 652 (Puyallup) lie west of the core herd area in PMU 44 and are greatly affected by suburban and urban development. Elk distribution is limited and less contiguous with smaller satellite populations inhabiting agriculture, residential, and urban land use areas. Elk in GMU 460 (Snoqualmie) also inhabit agriculture, residential, and urban land use areas. However, there is good potential for range expansion and population growth on commercial and recreational timber lands. Survey and management resources are generally directed to the core herd area. Physiographically, the area is part of the Southern Washington Cascade Province as described by Franklin and Dryness (1973), only GMU 460 (Snoqualmie) lies in the Northern Washington Cascade Province.
- B. Ownership:** Land ownership within the herd area is a checkerboard combination of private, state, and federal holdings. The majority of private land ownership is managed by commercial timber companies; state land is also managed primarily for timber production. USFS lands are managed for multiple use values, including timber, recreation, and wildlife with an emphasis on late successional forest (old growth) management. Mount Rainier National Park (MRNP) was

established in 1899 and is administered by the NPS for conservation purposes. Land ownership changes have occurred as a result of land exchanges and land sales involving private and federal lands.

- C. Topography:** Elevations in the elk herd area range from about 120 m (400 ft) along the western boundary to over 4265 m (14,000 ft) at the summit of Mount Rainier. Elk occupy a significant portion of this range, up to nearly 2300 m (7,500 ft) in the subalpine and alpine meadows of MRNP during the summer and fall months. Most of the herd area consists of low to mid-level mountainous forested terrain. The steepest and least accessible range includes the higher snow-covered elevations of MRNP and Cascade crest.
- D. Vegetation:** Much of the area below timberline is covered by coniferous forests. Three major forest zones, each named after the climax coniferous tree species characteristic of the zone, occur largely along an elevational gradient (Franklin and Dyrness 1973). In order of increasing elevation these zones are: the western hemlock (*Tsuga heterophylla*), Pacific silver fir (*Abies amabilis*), and mountain hemlock (*Tsuga mertensiana*) zones. Differences in soil type, moisture, elevation, aspect, and slope account for considerable habitat diversity even within the major forested zones. This is reflected in different seral species, co-dominants, and various understory communities.

Timber harvesting operations, virtually all by clear cutting, have greatly changed the character and structure of the majority of forests outside of MRNP. Originally the area was mostly unbroken climax forest with scattered sparse openings but with a large-scale fire history interval of about 434 years (Hemstrom and Franklin 1982). Native Americans may have maintained some of the higher elevation areas for huckleberry using fire; this undoubtedly affected game forage and elk abundance. Most areas are now a patchwork of recent clear-cut and relatively young forested stands except for some notable acreage of climax stands on USFS lands.

The Western Hemlock Zone is the most important zone with the highest potential for timber production. In the southern Cascades it generally reaches its upper limit at about 1000 m (3,300 ft.) elevation. Major tree species are Douglas fir (*Pseudotsuga menziesii*), western hemlock and, on moist sites, western red cedar (*Thuja plicata*). The most significant hardwood species include red alder (*Alnus rubra*) and big-leaf maple (*Acer macrophyllum*) occurring mainly as pioneering species on recently disturbed sites or in riparian habitats. Species composition in the understory varies, depending on site moisture and soil class. Hence, moist sites with better soils tend to be dominated by sword fern (*Polystichum miniatum*) communities while poorer, dry soils often support salal (*Gaultheria shallon*) understories. Most of the elk winter ranges are located within the western hemlock zone.

The Pacific Silver Fir Zone occurs from about 600-1,300 m (2,000-4,300 ft.) elevation. Wetter and cooler than the lower western hemlock zone, it has significantly more winter snow and hence a shorter growing season. Vegetative understory in this zone is often characterized by herbaceous species such as *Vaccinium* and *Menziesia*. This zone is often important summer range for elk.

The Mountain Hemlock Zone is the highest elevation forest zone in the area and is characterized by heavy winter snow packs that often persist for six to eight months. This zone generally occurs between 1,300-1,700 m (4,300-5,600 ft.) and gradually changes in structure from closed canopy forests at lower elevation ranges to open parklands of a distinct subalpine character near its upper limit. These open parklands and subalpine open meadows are often juxtaposed with lakes, wetlands, and timber stands, which combine to form a habitat mosaic that is important to elk as summer forage and calving areas. These habitats are most abundant in MRNP and provide the majority of summer and fall ranges for the GMU 653 (White River) elk herd.

III Historical Distribution/Population Level

A. Historical Population

The entire herd area is within the original range of the Roosevelt elk (*Cervus elaphus roosevelti*) (WDFW, McCall 1996). Although elk historically occurred in this area, they certainly were more limited in numbers and sporadically distributed than today. However, by the time MRNP was established in 1899, elk were not listed as part of the resident fauna (Bradley 1982). It is impossible today to accurately estimate the total number of Roosevelt elk that remained at the turn of the century other than to say that a few were still present. The factors contributing to the apparent depressed state of the historical native elk population are many and include: 1) a largely unbroken old growth forest that provided relatively little forage; 2) elk were sparsely distributed throughout the areas, concentrating on naturally occurring disturbed or productive sites, such as burns, alpine meadows, and riparian areas where forage would have been more plentiful; and 3) likely exploitation of accessible elk herds by Native Americans and European settlers. Whatever the actual status of the indigenous Roosevelt elk may have been, it is almost certain that the release of Rocky Mountain elk (*Cervus elaphus nelsoni*) near Enumclaw was a significant catalyst responsible for subsequent increases in elk numbers (WDFW, McCall 1996, Bradley 1982). This, coupled with corresponding changes in land management practices, such as clearing for agriculture crops and pasture, and timber harvest also contributed to improved habitats and increasing elk numbers. The initial release occurred in 1913 and involved 40 elk captured in Gardiner, Montana and released near Grass Mountain about 8 miles east of Enumclaw, (Pautzke, et. al. 1939). It seems reasonable that during this period of habitat improvement the introduced elk probably bred with the remnant Roosevelt populations. This elk herd is thought to be a mix of the two subspecies, although genetic studies have not been completed to confirm this

speculation. Palmation has been observed in antlers of mature bulls suggesting the presence of Roosevelt antler characteristics (Spencer and Richards unpublished data). The transplanted elk increased under legal protection from harvest and eventually expanded their distribution into adjacent areas. Favorable habitat conditions played a key role in the success of the elk transplant.

B. Current Distribution and Population Level

Elk seasonal distribution in the North Rainier herd area is delineated in Appendix C. Elk presence along the urban interface is increasingly affected by development causing nuisance and damage related problems. However, they should continue to receive management attention primarily for their aesthetic value. This is a viewpoint increasingly held and expressed by many citizens, who recognize the unique circumstances of having elk associated with remaining habitats along stream corridors, small forested wood lots, and parks; which helps to recognize, define, and establish the value of open space in urban neighborhoods.

GMU 653 (White River) supports the largest sub-population in the herd area. This is a classic migrating population where approximately two-thirds of the elk spend the early spring to late fall period in the high alpine meadows 1,364 - 1,818 m (4,500-6,000 ft) of MRNP. Then, following the rut and generally initiated by the first snowfall, the majority of elk begin moving down to winter range. Major migration corridors are the West Fork White River, Buck Creek, Haller Pass, and Huckleberry Creek. Elk also descend to this winter range from the upper Greenwater drainage and Crystal Mountain. Some migratory elk in this GMU move as far west as the Federation Forest State Park, about 15 miles east of Enumclaw and the eastern Clearwater River drainage. Then in late spring, elk follow melting snow and once again begin movement toward the south using the same major migration corridors. They inhabit the entire north portion of the MRNP to about 2195m (7,200 feet).

There are some resident elk that do not migrate and are scattered throughout the area with concentrations on the western portion of this GMU, in the Clearwater River and Three Sisters drainages, and Grass Mountain areas. Based upon radio-collaring studies (1998) conducted by the Muckleshoot Indian Tribe (MIT) resident elk currently represent about one-third of the GMU 653 (White River) total. In the Clearwater drainage we expect to see a gradual increase in elk population in response to timber harvesting activities that are providing increased winter and summer range and habitat carrying capacity. Elk forage habitat and carrying capacity will likely decline in the Huckleberry, Buck Cr., Dalles Ridge, and Greenwater drainages under current USFS management emphasis for late successional forests.

GMU 466 (Stampede) is the smallest unit and supports a small elk population. Radio-collared elk studies (1998) by the MIT indicate that elk summering in the Tacoma Pass area winter mainly on the east side of the Cascade crest. Tribal

studies and WDFW studies indicate that elk in the rest of the Stampede Unit spend a substantial portion of winter in the Green River Unit. Elk population dynamics in GMU 466 are discussed together with GMU 485 since these herds are mixed during winter and early spring when population estimates are made.

Green River (GMU 485) and Cedar River (490) are both municipal watersheds for the cities of Tacoma and Seattle area, and therefore general public access is prohibited. These combined areas total about 188,220 acres and are located in southeast King County. Some elk that winter in GMU 485 migrate to GMU 466 and upper reaches of GMU 490 during summer. Populations in both units have declined substantially in recent years.

GMU 460 (Snoqualmie) includes lands in the greater Snoqualmie River (north, middle, and south forks) and Skykomish River drainages. Elk likely colonized this area by dispersal from elk in the Cedar River population to the south. This relatively small but growing population occurs in small subgroups primarily in the south and middle forks of the Snoqualmie River, and the Skykomish River Valley. More recently, elk have been observed in the North Fork Snoqualmie drainage. This area offers the best habitat for possible herd expansion.

C. Proposed Distribution

Little change is anticipated in the overall distribution of the North Rainier Elk Herd. Elk distribution in GMU's 454 (Issaquah) and 652 (Puyallup) will likely continue to be negatively influenced by residential development and urban growth. This will likely further reduce the useable habitat for elk and increase the elk-human interactions leading to damage concerns. Local residents are interested in maintaining and protecting open space for wildlife thereby enhancing their "quality of life." Little or no change in distribution is expected in the remaining areas of the North Rainier herd; however, many areas can support population increases.

The management objective is to maintain the general herd distribution, but increase the population from current levels. This will require accurate monitoring of tribal and non tribal elk harvest, and implementing harvest management strategies that will allow for population growth. Management activities must include monitoring herd health to assess the influence of habitat, and determine mortality factors which in combination with hunting may exceed recruitment.

D. Genetic Considerations

Morphometric studies (Schonewald-Cox, et.al., in press) and electrophoresis by Dratch (1983) provide insight into the species/subspecies delineation and issues for this and other elk herds. Dratch examined 28 different gene loci and results indicate elk from western Washington (Roosevelt elk) had a higher percentage of polymorphism than elk from Idaho (Rocky Mountain elk). According to

Schonewald-Cox (op cit.) these results support the findings of Bryant and Maser (1982) and Cameron and Vyse (1976) who found very low polymorphism in Yellowstone elk populations. Basically, this points to an average higher heterozygosity in Washington elk populations that had not received transplants from Yellowstone herds compared to those that had received transplants. Further, she indicates Yellowstone elk have distinctly different allele frequencies and diversities of alleles from elk in western and central Washington, meaning elk from Yellowstone are particularly low in genetic variability based on electrophoretic techniques. However, data based on morphometric data suggest that there is “a very broad range of phenotypic expression among elk” (Schonewald-Cox op cit.). She points out that while classified distinct taxonomically, analysis of skull morphology and protein electrophoresis suggest there are few distinct elk subspecies in North America; indicating there are ecotype and phenotypic variations resulting from diet and habitat stresses, but these genetically detectable differences are at the population level, not at the subspecies level.

IV Herd Management

Herd History, Current Status, and Management Activities:

Estimated Population Size:

The early spring population size for the North Rainier herd (NRH) has declined since about 1989. The current population estimate is approximately 1,825 elk, which represents a decline of about 47% compared to the 1989 estimate of about 3,400 elk. Individual sub-herd size estimates are listed below in Table 1.

Population declines have been documented in GMU’s 454, 466, 485, 490, and 653, and 654. There are no population survey or trend count information available for elk in GMUs 454, 460, 652, and limited information in GMU 654 (R. Spencer un. pub data 1998), and the population decline projections are based on anecdotal information by WDFW personnel.

Historical population estimate information for GMU 490 is based on work done by D. Paige (per. com. 2000). Analysis of periodic, long-term trend count data here and in the adjacent Green River watershed, anecdotal information, and information from a 1999 mark-recapture project is the basis for concluding that this elk population has declined significantly.

The GMU 654 decline is based on analysis of long-term trend counts, analysis of antlerless elk harvest, population modeling, and a 1998 mark-recapture study on International Papers, Kapowsin Tree Farm (R. Spencer unpublished data). Many of the elk in GMU 466 spend winter and early spring in GMU 485, although a

limited number of elk begin moving into GMU 466 in early spring as snow cover declines. This population is discussed in more detail with GMU 485 later in this document.

Table 1. Minimum Spring 1989 and 2000 Elk Population Estimates

Game Management Unit (GMU)	1989 Elk Population Estimate	2000 Elk Population Estimate
GMU 454 (Issaquah)	250	200
GMU 460 (Snoqualmie)	125	175
GMU 466 (Stampede)	50	25
GMU 654 (Mashel)	550	375
GMU 652 (Puyallup)	275	200
GMU 485 (Green River)	750	150
GMU 490 (Cedar River)	450	100
GMU 653 (White River)	950	600
Total	3400	1825

White River Sub-Herd (GMU 653)

Bradley (1982) established a systematic fixed-wing aircraft survey in 1978 to assess elk numbers in MRNP. He used an index and a population extrapolation method to estimate the population and monitor changes. MRNP discontinued these surveys in 1988. However, the WDFW subsequently resumed these fall population index (FPI) flights, and modified the survey method to include use of a helicopter to classify elk. The MIT has cooperated since 1996 with WDFW to assist in conducting these survey flights.

Fall population trend data collected in MRNP for the period 1985-1999 indicate that the White River elk population peaked between 1988 and 1991 and has steadily declined since that time (Fig. 1,), (Spencer unpublished data). In general, there is a long term decline in the White River elk population. Between 1985 to 1988 flights were conducted using fixed-wing aircraft rather than helicopter. Our experience has demonstrated helicopter surveys are more accurate and complete, therefore we suspect the lower numbers during the fixed-wing period may reflect a difference in survey methodology rather than a population increase.

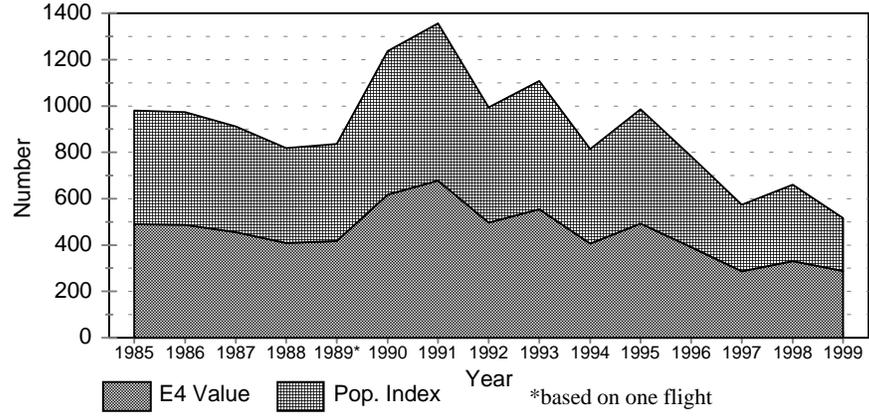


Figure 1. Fall population index values for GMU 472.

Beginning in 1987, the WDFW began systematic spring composition surveys to provide long term population trend data to compare with the September MRNP surveys (Fig. 2). Results of these surveys correlate with the fall population index data (Fig 1).

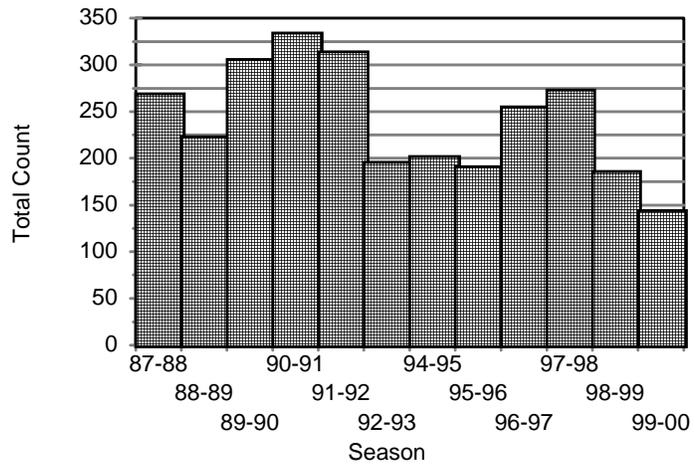


Figure 2. Spring helicopter counts for GMU 653.

In March of 1995, WDFW conducted a paintball mark-recapture survey of the White River Sub-herd, which provided a population estimate of 829 elk (range 693 to 966) composed of 524 cows, 204 calves, 95 branched bulls, and six spike (yearling) bulls (R. Spencer unpublished data). This survey was repeated in March and April of 2000, resulting in a population estimate of 434 elk (range 363 to 504) composed of 345 cows, 50 calves, 31 branched bulls, and eight spikes. This represents a 48%

decline from the 1995 estimate and supports the trend observed in the fall population index and spring trend counts. Both the 1995 (6 spikes) and 2000 (8

spikes) counts revealed low recruitment, and continued low calf:cow ratios raising concerns over recruitment to the herd and current bull harvest. This population estimate survey focuses on the MRNP migratory and resident elk in the core herd area, and does not include elk that winter west of Federation Forest State Park. The areas not surveyed includes elk in the Clearwater River drainage and Grass Mountain areas totaling about 140-180 elk. Our general observations suggest that elk in the Grass Mountain area have declined over the last seven years. Recent logging has improved summer and winter ranges and may have contributed to a slight increase in elk numbers in the Clearwater drainage.

A study initiated by the MIT in 1998, has documented yearly adult cow mortality rates of about 27% based upon a sample of 46 radio-marked elk (D. Vales. pers. comm. 2000). Spring calf:cow ratios of approximately 54 calves per 100 cows would be needed to balance the observed adult cow mortality. Adult mortality was identified as follows; cougar predation (22%), malnutrition predisposing elk to predation (17%), malnutrition (11%), highway mortality (11%), poaching (17%), wounding loss (6%), hunting (11%), and unknown causes (5%). All these factors played a contributing role in the population dynamics of this elk herd. Historically, antlerless harvest was greater prior to 1998 (Table 4 and Appendix E), which increased the cow mortality rate and was one of many factors that likely contributed to the population decline. In response to population declines, the MIT along with several other tribes, have ceased antlerless harvest in the White River GMU since 1998.

In summary the elk population decline in the White River sub-herd can be attributed to high adult cow mortality from hunting, predator losses, poaching, human disturbance, road kills, low calf recruitment, and changes in habitat quantity and quality.

The GMU 653 (White River) population will likely continue to decline unless recruitment improves and adult cow mortality is reduced. Low calf recruitment along with substantial bull harvest and other mortality means that this elk population may have difficulty meeting bull:cow ratio objectives of 12 bulls per 100 cows.

Green River Sub-Herd (GMUs 485 and 466)

Nearly all of the elk that spend spring through fall in GMU 466 spend a substantial portion of the winter in GMU 485 where population trend and composition data are collected. The home range of elk in this area includes both GMUs and they must be managed as one sub-herd. The MIT study (1998) documented that 15 of 39 marked elk spent time in both GMUs 466 and 485.

In 1994, WDFW conducted a paintball mark- recapture study to estimate elk numbers. The population was estimated at 612 elk (95% CI, range 544 to 680)

and classified as 460 cows, 50 calves, 85 branched bulls, and 16 spikes. In March and April 1997 another paintball mark-recapture estimate was made to assess population changes since 1994. The 1997 estimate was 227 elk (range 177-277), a decline from the 1994 estimate of 385 elk. A winter total trend count in 1997 resulted in 133 elk.

The Green River elk sub-herd (GMU 485) probably started to decline in 1992. The total number of elk counted during post season helicopter composition flights in March shows a decline from 1992 through 1999 (Figure 3). The 1994 population estimate indicated only 50 elk calves were recruited to the population. Low recruitment and high adult mortality resulted in a declining population.

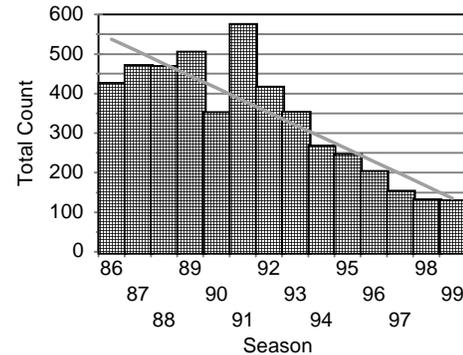


Figure 3. Total counts of elk during helicopter census in GMU 485.

Adult cow mortality is currently (1998-2000) about 24% per year (D.Vales per. com. 2000). This exceeds recruitment rates and forecasts a continued population decline.

A three year (1998-2000) cooperative elk calf study by the WDFW and MIT, through the second year of the study, showed a n 81% average annual mortality rate. Predator related mortality included; cougars 59%, followed by unknown predators 15%, and bears 7%. Total mortality resulted in only 6 calves per 100 cows surviving through the following spring (March).

This elk herd has been negatively impacted by several factors concurrently: 1) Increased antlerless elk harvest during a time of high predation. 2) Low calf survival, due in part to predation, has not replaced adult mortality. 3) Limited bear and cougar harvest. These predators are likely at maximum densities relative to prey availability.

Adult elk body condition is being jointly studied by the MIT, WDFW, National Council for Air and Stream Improvement, City of Tacoma, Plum Creek, Weyerhaeuser, Army Corps of Engineers and Rocky Mountain Elk Foundation. Preliminary findings indicate that Green River elk have less body fat and correspondingly are in poorer nutritional condition than other Washington elk populations. Habitat and lactation demand ultimately determine body condition and affect pregnancy rates, calf in-utero survival, calf birth weight and survival, and adult survival. Adults (2 years and older) pregnancy rates in the Green River are >92%. The MIT elk study has not yet documented adult mortality due to malnutrition in the Green River as has been documented in the White River. While predation is the most significant proximate factor affecting this population,

habitat ultimately will determine herd health and size.

Herd Composition:

Standardized September (preseason) and March (post-season) helicopter herd composition surveys are conducted annually in GMUs 653 (White River), 654 (Mashel), and 485 (Green River).

White River Sub-Herd

Pre and post season helicopter herd composition surveys have been conducted by the WDFW since 1988. The MIT and WDFW have cooperatively conducted these surveys since 1996.

The preseason composition data are collected during the MRNP fall population index flights. The post season herd composition data is collected from established routes on elk winter and spring range to determine calf production and survival. Results of these surveys are presented in Tables 2 and 3.

The declining pre and post season spike:cow and calf:cow ratios are of concern. While there are fluctuations in the spike:cow ratios over these years, long-term averages indicate a decline from historic levels. Between 1988 and 1993 pre and post season spike:cow ratios averaged 8.3 and 8.9 respectively, compared to 1994-1999 ratios of 5.6 and 5.2, representing a decline of about 32 and 43 percent respectively. Preseason calf ratios have shown only a slight decline, averaging 38 and 37 calves per 100 cows for years 1988-1993 and 1994-1999 respectively. In contrast, average post season ratios for years 1988 to 1993 of 35 calves per 100 cows has declined 23%, to 27:100. The data suggest increased mortality of calves on winter range may possibly be due, in part, to concentrated predation or more likely the interactive effects of habitat, weather, hunting, and predation. In both the pre and post season data, calf production is below average compared with other herds (Thomas and Toweill, 1982). Pregnancy data obtained during April 1998 in GMU 653 indicated that 85% of 33 adult cows over 2 years of age were pregnant.

Green River Sub-Herd

Prior to 1986, elk composition was gathered primarily from ground surveys by foot or vehicle. Standardized helicopter surveys are now the primary method, supplemented with ground surveys. Preseason (September) Bull: Cow: Calf ratios from 1984 -1997 are presented in Table 3. The pre season composition shows a great variability in calf:cow ratios since 1984. These rates are below the average for other western Washington herds and falls below recruitment needed to replace adult mortality.

Table 2 GMU 653 pre and post-season bull and calf:100 cow ratios, 1988-1999.

Year	Spike bull		Branched bull		Total bull		Calf	
	pre-season Sept.	post-season March	pre-season Sept	post-season March	pre-season Sept	post-season March	pre-season Sept	post-season March
1988	7.7	7.5	14.0	3.8	21.7	11.3	39.0	28.0
1989	9.2	6.8	12.0	4.0	21.2	11.0	40.0	38.5
1990	8.0	12.5	16.5	1.3	24.5	13.8	35.0	35.0
1991	5.6	6.8	16.0	1.8	21.5	7.6	45.0	33.0
1992	13.0	10.6	21.0	7.3	34.0	18.0	42.0	41.5
1993	6.5	9.6	24.0	3.0	30.5	12.6	27.0	36.0
1994	5.5	1.7	27.0	17.6	32.5	19.4	50.0	34.4
1995	8.2	5.0	18	9.0	20.2	14.0	35.5	42.0
1996	5.5	5.6	25.6	9.3	31.0	15.0	37.0	27.0
1997	7.0	9.6	23.0	18.8	30.0	28.4	38.0	26.7
1998	4.7	7.1	26.0	9.7	30.8	17.0	33.5	20.0
1999	3.0	2.2	25.4	9.1	28.4	11.3	29.0	14.4
2000	3.8	0	17.5	0	21.3	0	25	0

The pre season branched bull ratios have generally increased since 1984 and remain at about 29:100 cows (Table 3). Pre season ratios for branched bulls have remained stable from 1994-1997. No data was collected in 1998 or 1999 because of low population levels. Post season (March) composition counts since 1985 show a general decline in calf survival since 1993, (Table 3). Post-season spike ratios for 1988-90 are higher than pre-season and likely reflect the combined effect of limited spike harvest and the reduction of adult cows as a result of permit hunting.

Mortality Assessment:

Past state elk harvest regulations (Appendix F) were designed to provide maximum recreational opportunity. However, in GMU's 652 and 454 liberal elk hunting seasons and regulations were used to reduce elk numbers because of damage and landowner conflicts.

Table 3 GMU 485 pre and post season bull and calf:100 cow ratios, 1984-1999.

Year	Spike bull		Branched bull		Total bull		Calf	
	pre-season Sept.	post-season March	pre-season Sept	post-season March	pre-season Sept	post-season March	pre-season Sept	post-season March
1984	7.0	5.5	21.0	3.0	28.0	9.0	41.0	21.0
1985	8.0	6.0	12.0	4.0	20.0	10.0	36.0	30.0
1986	8.0	4.0	19.0	9.0	27.0	13.0	30.0	23.0
1987	13.0	5.0	14.5	5.0	27.5	10.0	22.0	15.0
1988	7.5	8.0	36.0	11.0	43.5	19.0	35.0	22.0
1989	5.3	6.0	28.0	12.0	33.3	18.0	28.0	21.0
1990	5.4	7.5	31.0	19.5	36.4	27.0	26.0	15.0
1991	7.5	7.4	26.0	23.0	34.0	30.0	15.0	14.0
1992	5.0	9.3	30.0	11.0	35.0	20.0	33.0	21.0
1993	3.0	3.4	26.0	18.5	29.0	22.0	20.0	12.0
1994	8.0	3.7	30.0	16.0	38.0	20.0	22.0	13.0
1995	11.0	4.3	29.0	9.2	40.0	13.5	26.0	10.0
1996	7.0	2.3	29.5	6.0	36.6	8.4	25.0	11.5
1997*	8.3	3.4	27.7	23.5	36.0	27.0	30.0	7.0
1998*	NA	1.8		12.7		14.5		6.4
1999*		3.0		18.0		21.0		9.0

* Data provided by MIT.

The hunter effort and harvest information (1993-1998) from the NRH is summarized in Table 4. In GMUs 466, 652, 653, and 654, declines in both the number of hunters and hunter days are notable, ranging from 39% to 58% (Table 5). Much of this decline can be attributed to reduced elk numbers and hunter participation.

White River sub-herd harvest

Elk seasons in GMU 653 generally restricted the state authorized hunter harvest to bull elk, with cows protected. There was a short period, 1969 to 1973, when 50 either-sex permits were issued annually. Either-sex archery seasons were initiated in 1985 and ended in 1997. It is uncertain if the limited archery antlerless harvest during this period affected herd population dynamics. The actual number of elk harvested during state established seasons has varied from year to year due to changes in hunting regulations, the number of hunters and variable weather

(Tables 4 and 5). In mild winters and late snowfall years, elk remain in MRNP and are unavailable to hunters. In contrast during years of heavy or early snowfall, such as experienced in 1983 and 1984, elk move out of MRNP and have greater vulnerability to hunter harvest.

Table 4. Average and range of elk harvest, hunters, and hunter days for the period 1993-1998 for state authorized hunters.

GMU	Average harvest		Range of harvest		Average Hunter Days/year	Range Hunter Days	Average # of Hunters	Range # of Hunters
	Bull	Cow	Bull	Cow				
454	30	18	11-41	5-41	3167	2560 -5125	632	394-704
460	16	7	10-19	0-13	2136	1248 -2856	532	293-713
466	10	8	8-19	0-22	1995	1077 -3890	330	216-714
485*	14	32	11-16	14-46	250	250	50	50
490	2	0	0	0	369	87 - 487	79	31-206
652	25	27	14-44	0-39	4671	2136 -6958	926	437-1406
653	37	11	21-48	0-23	7005	4624 -9972	1583	1074-2208
654	28	18	15-49	3-34	3813	1810 -5802	729	467-1336

* permit only hunt

Table 5. Average decline in hunters days and hunter numbers comparing years 1993-1995 to 1996-1998 for GMUs 466, 652, 653, and 654 for state authorized hunters.

GMU	Average Hunter Days			Average Hunter Numbers		
	Period 1993-1996	Period 1996-1998	Percent Decline	Period 1993-1996	Period 1996-1998	Percent Decline
466	2522	1469	-42	504	306	-39
652	6283	3059	-51	1239	612	-51
653	8321	4070	-51	1863	889	-52
654	5465	2280	-58	1257	574	-54

Reported total harvest in GMU 653 has declined between 1987 and 1999 (Figure 4). Reported antlerless harvest for all periods should be considered minimums, as not all tribes report. Figure 4 does not reflect figures in Appendix D. This is due to the method of collecting and recording hunting mortality data in GMU 653 during the period between 1987 and 1994. Additional mortalities were searched for and recorded by driving roads, hiking, and counting and marking gut piles of elk harvested primarily during the winter period, when state established seasons were closed and tribal seasons were open. We recorded this as tribal hunting mortality, and are confident this method provided a minimum harvest estimate of

elk during this period. Most of this harvest was not reported and is not represented in Appendix D and this is why there are discrepancies between Figure 4, and Appendix D.

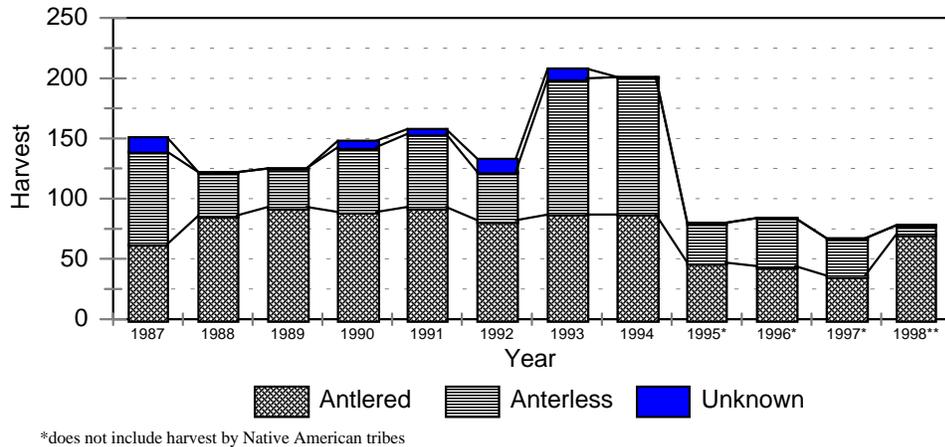


Figure 4. Harvest of elk in GMU 653.

Green River Sub-Herd Harvest:

Hunting has been authorized in GMU 485 by permit only (limited-entry) since 1984. Hunters enter and exit this GMU at one of two specified gates. Beginning in 1985, a special either-sex elk permit hunt was established by WDFW for a five-day all citizen’s hunt. The MIT established their own limited entry permit only hunting season in 1992. Annually, WDFW, City of Tacoma, landowners, and MIT meet and agree upon the number and kinds of permit hunts, distribution of permits and access to the watershed (Appendix D).

Initially, hunters with either-sex permits focused on the take of branched-antlered bulls, which resulted in a subsequent decline in the post season bull ratios (Table 4). As a result, permit allocation was changed in 1986 to reduce bull harvest and increase antlerless harvest.

Total elk harvest remained fairly consistent for the years 1984-1991, averaging 46 elk. Between 1992 and 1994 the average harvest increased to 57 elk, dropping to 44 and 25 elk respectively in 1995 and 1996 despite the same permit level allocation (Figure 5).

The increase in harvest from 1992-1996 coupled with a decline in pre and post season calf survival (Tables 3 and Figure 5) and continued predation is believed to have contributed to a decline in the population.

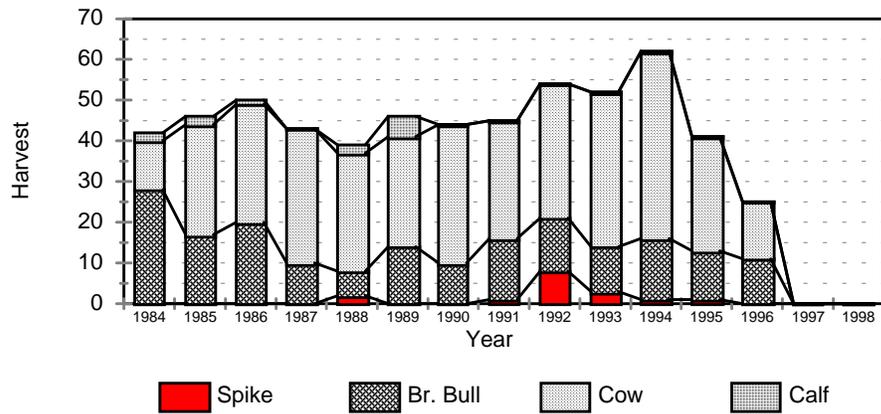


Figure 5. Harvest of Elk in GMU 485.

As discussed previously this population is linked with GMU 466 and data suggests antlerless harvest contributed to the decline of elk in GMU 466 and 485. Average annual harvest for the years 1985 to 1994 was about 12 and 34 cows respectively in GMU 466 and 485; combined average harvest was 46 antlerless elk per year. Average combined antlerless harvest (GMU 466 and 485) during the documented period of decline was 11% higher (48 vs. 43) for years 1990 to 1994 compared to years 1985 to 1989 (Fig. 6). Also, this harvest increase generally

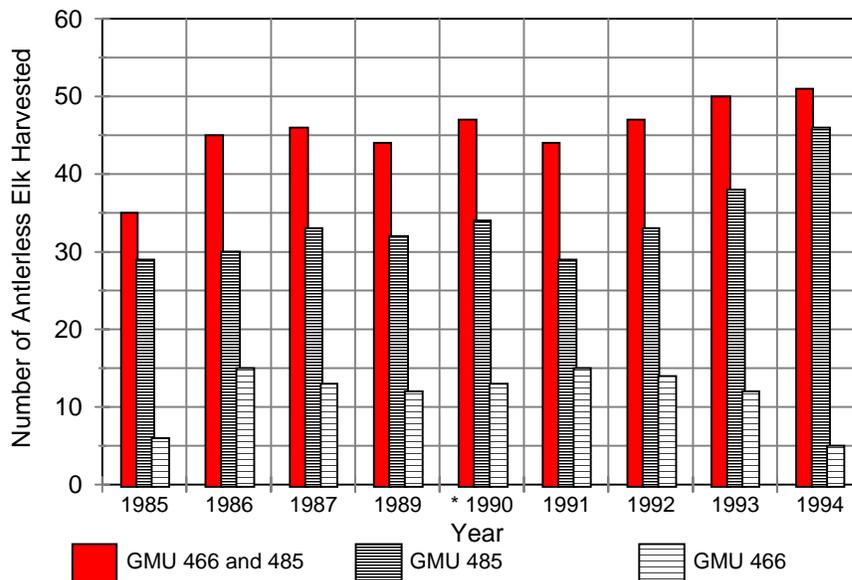


Figure 6 GMU 466 and 485 antlerless elk harvest for years 1985-1994

* Note: Assumes average (85-94) harvest for 1990 in GMU 466 when no data available and includes calves killed in GMU 485 hunts.

follows the declines noted in the spring flights beginning in 1992 (Fig. 3). There was also a gradual decline in antlerless harvest in GMU 466 and an increase in harvest in GMU 485 between 1991 and 1994, suggesting there may have been a decline in the eastern sub-herd(GMU 466) segment as harvest increased in the western sub- herd (GMU 485) area. Although seemingly small, the antlerless elk harvest in GMU 466 is believed to be an important component which contributed to the decline of the elk population in GMU 485. Finally, there may also have been undocumented harvest in GMU 466 that would have contributed to the elk population decline during this period.

The elk hunting season in GMU 485 (Green River) has remained closed since 1997. Between 1984 and 1991 hunter success rate was high, averaging 91% (range 78-100 %). Between 1992 and 1995 the success rate declined, averaging 67% (range 44-83%). The 1996 success rate of 27% was the lowest recorded since the hunt began in 1984 (Figure 7).

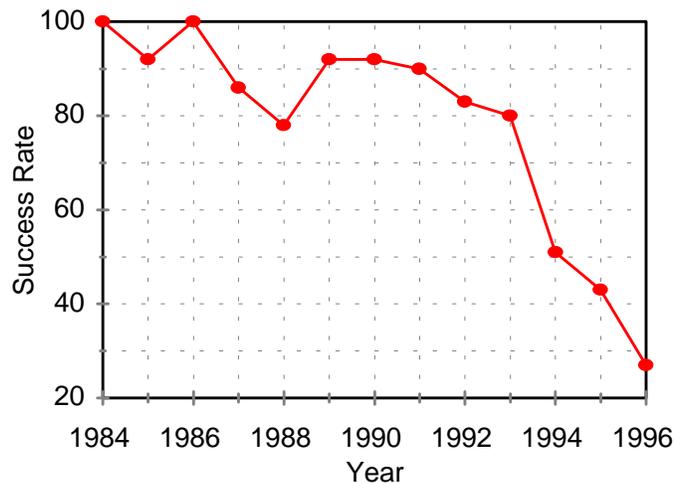


Figure 7. Hunter success for elk in GMU 485.

Tribal Hunting Harvest:

Individual tribes establish their own off-reservation hunting seasons and regulations, which typically start in August and run through January, but can extend to February and March. These long hunting seasons are a concern to WDFW because of added stress of disturbance. In addition, Tribes can exercise their treaty right to harvest elk for ceremonial purposes outside the established tribal hunting season. The reported antlerless harvest for 1993 and 1994 likely contributed to the decline in White River elk population size. The MIT has suggested that past antlerless harvest was excessive and very likely exceeded recruitment rates in GMU 653 (D. Vales per. Comm. 1999). In 1998, the MIT and some other tribes suspended antlerless hunting in GMU 653. Tribal reporting and sharing of harvest has improved and for some tribes, and maybe more

accurate than state harvest figure estimates (Appendix E).

Nutrition:

The nutritional status of elk in GMUs 485 and 653 is being investigated. Body condition scores and ultrasound measurements collected from elk studies between 1998 and 2000, showed chronically low fat reserves (unpub. data in progress). This forecasts a lowered nutritional plane for adult cow elk, leading to reduced overall body condition; the effect may accumulate over time, resulting in breeding pauses and lower calf birth weights. Lighter born calves have been shown to have significantly lower survival probability; a common reason for light calves at birth includes poor cow condition (Thomas and Toweill 1982). The MIT adult cow study (1998) has documented about 8% annual malnutrition related mortality in the White River population, but no detectable malnutrition in the Green River population. Pregnancy rates of elk >2 years old in the Green River were >92% during April 1998-2000, compared to 85% in April 1998 in the White River.

Natural Predators:

Cougar and black bear prey on elk in the North Rainier herd area. Cougars kill both adults and calves, while black bear almost exclusively take calves (R. Spencer, un pub data, D. Vales, MIT, un pub. data, J. Smith et. al. 1994). Black bear scavenging of cougar kills may increase the cougar predation rate and can result in a higher number of cougar kills. Higher black bear density could increase rate of cougar predation.

Based on results of monitoring radio-equipped cows in the White River study area, predation by cougar equals about 22% of total mortality and is the leading cause of mortality to adult cow elk (Table 6). A similar study in the Green River showed cougar predation is the leading cause of mortality, accounting for 37% (13 of 35) of deaths to adult cows (D. Vales, unpublished data).

Cougar predation in GMU 485 (Green River), accounts for 59% (32 of 54) and bear 7% (4 of 54) of the total elk calf deaths. Unknown predators, likely including, cougar, bear, and to a lesser degree coyote, and bobcat, accounted for about 15% (8 of 54) elk calf deaths (WDFW and MIT, unpublished data).

Other Mortality Sources:

Based on preliminary results of the continuing antlerless elk study by the MIT, elk die from a variety of causes. Predation by cougar is the most significant cause followed by hunting and hunting related activities. Sources of mortality documented in the MIT study for GMUs 485 and 653 are presented in Tables 6 and 7 (D. Vales, unpublished data, 2000).

Smith et al., (1994), working in areas and during a time of minimal tribal hunting, found total elk mortality was caused from a variety of sources; 59% hunting, 15% poaching, natural causes 15% of which 76% was malnutrition and 16% from

Table 6 White River (GMU 653) antlerless elk mortality sources.

no. marked	no. dead	cougar	road kill	mal-nutrition	mal/cougar	wound/cougar	poach	hunt/poach	hunt	unk
43	17	4	2	2	2	1	3	1	1	1

Table 7 Green River (GMU 485) antlerless elk mortality sources.

no. marked	no. dead	cougar	road kill	mal-nutrition	mal/cougar	wound/cougar	poach	hunt/poach	hunt	unk
37	13	9	0	0	0	0	0	0	3	1

cougar predation, and 7% wounding loss. We expect a higher wounding loss should be suspected in this sub herd area because of extended and prolonged hunting seasons than that documented by Smith et al., (1994). We are uncertain of the potential impacts to other sub herds, but suspect wounding loss to be higher with prolonged seasons.

B. Social and Economic Values

Hunting: The value of elk to the state and local economy is estimated to be as high as \$1,945 per harvested elk in the Blue Mountains (Meyers 1999). The 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported that trip and equipment expenditures for big game hunting in 1996 averaged \$860 per hunter (U.S. Department of Interior, et al. 1996). For example, there were 1,074 hunters reported hunting GMU 653 (White River) in 1998. Using the \$860 average expenditure per hunter from the National Survey, GMU 653 hunters added approximately \$923,640 to the local and state economy in 1998.

Historically, recreational hunters of the GMU 653 elk herd provided much higher economic potential and income to the small businesses of the local area. During the fourteen-year period, 1984 to 1998, hunter numbers have declined significantly. Hunter numbers averaged 3,625 for years 1984 to 1991, compared to 1,445 for years 1992 to 1998, a 60% decline. Using the \$860.00 average dollar expenditure from the National Survey this represents a decline from \$3,177,500 to \$1,242,700 for the seven year average comparisons between 1984-1991, and 1992-1998 without making adjustments for inflation. Between 1993 and 1998 a similar decline in the average number of hunters and potential revenue to local economies occurred in GMUs 466, 652, and 654 (Table 5).

Hunter Numbers: Average hunter numbers and days for the period 1993-1998 are summarized in Table 5. The number of state authorized hunters shows a notable decline for years 1984 to 1999 in GMU 653, (Figure 8).

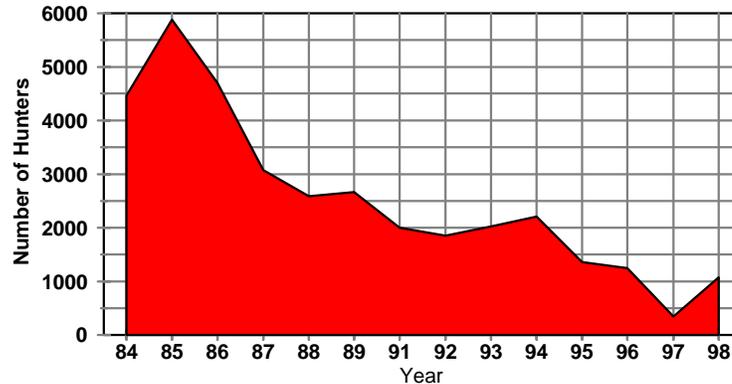


Figure 8. Number of state hunters in GMU 653 (White River) for 1984-1999

Tribal hunting increased during the mid to late 1980's and continues today, but we have no information on the number of tribal hunters or success rates.

Harvest Strategies: Specific recommendations for harvest strategies will be made every three years as a part of the current WDFW Commission policy of adopting hunting seasons for a three-year period with annual establishment of permit seasons and necessary amendments for population management or damage control. The three-year hunting package will serve as the harvest management implementation plan. Tribal participation in the formulation of specific recommendations and harvest strategies begins at the regional level. WDFW regional staff and field personnel meet with tribal representatives to coordinate harvest management strategies and other elk management activities.

Historically, harvest strategies have varied by individual GMUs that comprise the NRH. Various harvest strategies have been used to 'maximize' recreational opportunity and yet maintain the delicate balance of controlled or managed removal of elk. The following strategies have been used: (1) general seasons with legal animal descriptions ranging from either-sex to any bull, spike-only, 3-5 point antler minimums, (2) general seasons in combination with permit-only opportunities, and (3) 'permit-only' seasons to provide quality hunting opportunity. More liberal season structures may be applied to GMUs where elk damage is a concern and where hunter access limitations exist, and more conservative seasons in GMUs where the elk population has declined, shows poor recruitment, or where bull ratios are below management objectives. Season length and timing has also been used to regulate harvest. Resource allocation among user groups was initiated in 1984 requiring state hunters to choose their method of

hunting. Harvest strategies for years 1970 to 1999 are presented in Appendix F. Individual tribes set their own hunting seasons and regulations and may use different harvest strategies. WDFW considers tribal harvest prior to adopting state hunting seasons and regulations.

White River Elk Sub-Herd

In the early 1970's general elk hunting season rules allowed state hunters to take any bull and in addition 50 either-sex permits was available annually between 1969-1973. Any bull hunting was replaced by a 3- point or better antler restriction in 1988, in an attempt to increase post hunting season bull ratios. In 1992, the harvest regulation was changed to spike-only hunting and branch-antlered bull by permit only as a quality management strategy. In 1997, the hunting season was changed to permit-only for all non-tribal hunters. Following the 1997 season, public opposition forced a return to general season 3-point or better bull hunting in 1998. In general, state hunters have not shown support for permit-only elk hunting.

Green River Elk Sub-Herd

The harvest management objective for this herd was established in 1984, to provide a quality hunting opportunity for mature bulls and maintaining high success rates for spike bull and antlerless elk hunting. Despite its small size, GMU 485 gained a reputation for quality hunting and has been one of the most popular permit hunts in Washington State. The hunter demand for permits to hunt this area far exceeded the supply. Permit drawing odds were consistently low with greater than one chance in 30. Because of elk population declines, this hunt has been closed since 1997 and will remain closed until the population and herd recruitment recovers to acceptable levels.

Damage: The WDFW is required by legislative mandate, under RCW 77.12.070 and 77.12.280 to respond and compensate landowners for damage caused by elk (Appendix G). Methods to control elk damage include: general seasons, permit seasons, hot spot hunts, landowner permits, hazing, trap and transplant, fencing and lethal removal.

In general, there are minimal damage concerns for the core herd area. Some elk have habituated to humans and development in and around the Crystal Village area, east of the community of Greenwater. These elk are often fed by local residents during the winter and early spring months and the WDFW receives virtually no complaints about damage in this area. Elk damage is a concern in some portions of GMU 654 (Mashal), near Eatonville and Graham. Hot spot hunts historically have been used to control elk numbers and reduce damage in these areas. Liberal seasons in the Issaquah (454) and Puyallup (452) GMUs are designed to reduce and control elk numbers in response to chronic elk damage concerns. A late season permit only hunt for antlerless elk for the 2000 season has been designated in portions of these units to address elk damage. Except for

occasional damage issues on two golf courses, elk damage complaints are seldom received in GMU 460 (Snoqualmie), despite elk occurring within the city limits of Snoqualmie and North Bend.

Watchable Wildlife Values: This elk herd provides substantial viewing opportunities, especially in GMU 653 (White River), where elk summer in MRNP. This area provides one of the state's most unique opportunities to view elk, particularly during and following the calving and rutting periods. Elk viewing accounts for thousands of recreational days to park visitors from across the country. Viewing is usually a seasonally important economic opportunity for local businesses and is often the principal method for the state and cooperators to gain increased public awareness and support for elk and other wildlife resource issues.

This elk herd is also spiritually and culturally important to Native Americans.

V Habitat Management

A. Current Condition and Trend in Habitat

Elk habitat includes all features of the landscape necessary to support a viable elk herd. The maximum number of elk that can exist in any habitat is generally controlled by forage. Important components of elk habitat are forage availability, and its location, size, and juxtaposition in relation to escape cover.

Since 1990, the Rocky Mountain Elk Foundation has helped fund elk habitat enhancement, research, and educational projects in the North Rainier elk herd area, (Appendix H).

White River Sub-Herd

MRNP contracted with the University of Washington in 1984 to determine long range winter carrying capacity of forested lands outside the Park boundary. A computer simulation model (HABSIM) was developed to model the relative response of elk populations to changes in forest succession based on historical and projected forest management. Elk habitat is measured by modeling changes in Potential Seasonal Carrying Capacity (PSCC) of different forest seasonal stages and their capacity to support elk (Raedeke and Lemkuhl, 1984).

Assuming at that time, current forest management practices, HABSIM results indicated a decline in PSCC to about 85% of 1980 levels by the year 2030 on all lands in the area (Raedake and Lemkuhl, 1984). On USFS lands the decline was projected to be more dramatic, nearly 40%.

Jenkins and Starkey (1990) assessed elk winter range use and projected future habitat trends on forested lands north of the MRNP. Their model was similar to

Raedeke and Lemkuhl in that it linked successional patterns with habitat quality to permit long-term assessment of forest management practices on elk. This study incorporated site-specific data on elk distribution, forest succession and forage availability. Results supported the conclusions of HABSIM and predicted similar trends in elk populations in response to forest management.

The simulated response of Forage Value Index (FVI) on elk winter range to forest harvesting were discussed by Jenkins and Starkey (1990). They predicted that forage value would decline steadily, well into the future regardless of harvest level. This decline in forage values reflects a loss of created openings and clearcuts. Another important consideration recognized by Jenkins and Starkey (1990) is the importance of mature/old growth timber in maintaining elk populations during severe winters both because of forage resources available within them and reduced energetic costs of forage in old growth. They concluded that a mosaic of immature and old-age forest is optimal for elk.

The USFS, Northwest Forest Plan was implemented in 1998 with the goal to protect old-growth forest species and wildlife diversity. As a result, nearly all of the USFS acreage in the White River has been designated as “Late Successional Reserve” (LSR), meaning there will not be any timber harvesting. Early successional patches could only be created under the existing plan. Management actions in LSR’s are limited to promoting old forest characteristics in second-growth stands. As a result, much of the forage base for elk on USFS lands will revert to what is provided in older stands. These stands will provide good cover and show intercept capability, but a reduced capacity to support elk compared to forage provided in younger stands. A more rapid decline in elk forage under a no cut alternative policy is predicted. The Gifford Pinchot National Forest has estimated a 40% reduction in elk carrying capacity in Late Successional Reserves.

Logging has removed the majority of mature forest vegetation on winter and spring ranges known to be used by elk. Between 1950-1969 the majority (90%) of elk winter range was logged, leaving only 2% of original old growth forest (Jenkins and Starkey 1990).

Many of the elk in the North Rainier herd area summer at high elevations and their descent to winter range is triggered by the first snowfall, generally in early October. Leege and Hickey (1977) found that 93% of the elk were concentrated in areas constituting only 27% of the drainage where snow was less than two feet deep. Working in Montana, Bohne (1974) reported fall movement to winter range was influenced by deep snow on summer and transitional ranges. The survey flights and ground observations have revealed the vast majority of elk migration from MRNP begins when initial snow falls in early October (R. Spencer unpublished data). The MIT study (1998) has documented that some adult cows migrate to winter range long before snow fall at high elevations.

A preliminary estimate of the White River elk winter habitat by drainage is presented in Table 8. Elevational limits used to delineate usable winter range (UWR) and essential winter range (EWR) are indicated.

All available data suggests a decline in GMU 653 (White River) sub-herd winter range carrying capacity since the early to mid-1980's.

Table 8. Approximate acreage of GMU 653 (White River) winter range

	Drainage Acreage	Unusable Winter Range baseline 2,400' south facing slopes 2,800'	Essential Winter Range baseline 2,200' south facing slopes 2,400'
Greenwater	45,900	9,530	2,900
Huckleberry	24,800	6,980	1,290
White River	81,500	53,900	35,225
Totals	152,200	70,410	39,415

Green River Sub-Herd

Winter habitat availability and potential carrying capacity (PCC) for elk was determined using the HABSIM model in GMU 485 (Raedeke 1995). He proposed four timber harvest options and evaluated the change in PCC for elk and concluded there has been a long-term decline, about 20%, since about 1955.

B. Roads and Road Management

Roads can have a negative impact on elk. They are vulnerable to year round harassment from a variety of recreational and other activities associated with motorized vehicle access. A number of studies have shown the negative influence roads can have on elk use of the surrounding environments (Thomas and Toweill 1982, p. 455).

In the early 1980's the WDFW, Weyerhaeuser, and the USFS entered into agreements that closed some roads in GMU 653 to provide protection to elk winter range on the White and Greenwater Rivers, Dalles Ridge, and Buck Creek, between December 15 to April 1. In addition, road closures were implemented during state established hunting seasons to protect elk migrating out of MRNP. Hunters formed what essentially was a "firing line" which unfairly restricted elk movement to winter range. There is also a road management program, initiated in the mid 1980's, in GMU 654 (Mashel) on DNR lands east of Eatonville. This was designed to provide a "quality" walk in opportunity to hunters and protect elk winter range.

VI Research- Past Research Conducted and Present Needs

Population and Mortality Studies:

1. GMU 653 - Bradley (1982) worked to establish a systematic population index trend survey in MRNP. R. Spencer (WDFW 1989 - 1999 unpub. data) revised and continued these index surveys using a helicopter. Since 1996 these surveys have been conducted as a cooperative effort with the MIT.
2. GMUs 485, 654, and 653 - R. Spencer (1994,1995,1997,1998, and 2000) conducted elk paintball mark-recapture population estimates on winter/spring range
3. GMUs 485 and 653 - David Vales, biologist for the MIT, began research in 1997 on antlerless elk population sightability estimates, mortality sources, and habitat use areas.

Habitat Assessment:

- GMU 653 - MRNP Elk Habitat Impact Assessments 1970's-mid 1980's.
- GMU 653 - Radaeke and Lemkuhl (1984), and Jenkins and Starkey (1990).
- GMU 485 - Radaeke (1995)
- GMU 653 - USFS, MIT, WDFW, Huckleberry Land Exchange Analysis

Research Needs:

- 1) Conduct a bull mortality study in GMU 653 - This study should be designed to determine the types and degree of bull elk mortality. Research is necessary to ensure that bull elk escapement objectives are met. This research proposal is needed because of extended hunting seasons that are primarily focused on the take of the antlered segment of the population. Documented population declines, and current data suggest bull escapement goals are not being met.
- 2) Determine the type and degree of calf mortality where recruitment is not being compromised by habitat related problems.
- 3) Consider a reassessment of the Raedeke and Lemkuhl and Jenkins and Starkey habitat studies with on ground inventories on the landscape scale and make projections of habitat capability to support elk into the future.
- 4) Determine if elk summer range condition in MRNP is linked to nutrition related concerns for elk in GMU 653.
- 5) Evaluate habitat improvement projects by monitoring body condition of elk using these habitat improvement sites.

VII. Herd Management Goals:

The North Rainier Elk Herd Plan provides the historical background, current condition and trend of this important resource. It is essentially an assessment document that

identifies management problems, develops solutions to overcome these problems, and set management direction. The plan outlines strategies and helps establish priorities in resolving management of the elk herd. It provides a readily accessible resource for biological information collected from the herd and identifies inadequacies in scientific information.

The goals of the North Rainier Elk Herd Plan are:

1. To manage the North Rainier elk herd for a sustained yield.
2. To manage elk for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography.
3. Preserve, protect, perpetuate, manage and enhance elk and their habitats to ensure healthy, productive populations.

VIII Management - Objectives, Problems and Strategies:

A. Herd Management

1. *Objectives:* Improve collection of an accurate scientific database to manage elk populations.

Problems: We have been using hunter harvest information (kill and hunter effort) collected from report cards and hunter sampling questionnaire to determine harvest. This is not providing accurate information for use at the GMU level. Harvest data is not currently available from all tribes, compounding harvest data concerns. Accurate population estimates and harvest data collection are basic needs for predicting a population response to hunting and making reliable, scientifically sound management recommendations.

Strategies:

- a. Improve harvest data collection from state hunters by adopting a mandatory hunter report for all hunters, whether successful or not.
- b. Work cooperatively with tribes to obtain complete tribal harvest data and timely reporting.
- c. Work cooperatively with the tribes to demonstrate the concerns of extended late hunting seasons on elk populations.
- d. Continue cooperative population index and herd composition surveys.
- e. Develop and maintain a population modeling database to predict population responses to harvest, other mortality sources and assist in management decision making.
- f. Implement management strategies that will achieve a minimum

- post season ratio of 12 bulls per 100 cows.
- g. Ensure management is dynamic and utilizes information collected from current and future studies.

- 2. *Objective:* Increase elk population numbers in the following units:
 - GMU 460 (Snoqualmie), from 125 to 500 elk
 - GMU 485 (Green River), from 150 to 500 elk
 - GMU 653 (White River), from 600 to 900 elk, with fall index flights in MRNP approaching 600-700 elk.

Problem: Winter/spring habitat declines, nutritional limitations, adult mortality that exceeds recruitment, and excessive hunting mortality continue to be problematic for the short and long-term recovery of this elk herd.

Strategies:

- a. Reduce adult and calf mortality by recognizing and managing mortality factors including hunter harvest.
- b. Increase enforcement emphasis to reduce poaching.
- c. Work with DOT to minimize elk deaths from vehicles along Hwy. 410.
- d. Work jointly and cooperatively with Tribes to monitor antlerless harvest on elk populations that show declining population or reproductive trends.
- e. Maintain current road management programs and work cooperatively to identify additional winter range road closure opportunities to benefit elk.
- f. Work with International Paper (Rayonier Timberlands) through the PLWMA agreement to manage for an increased elk population on the Kapowsin Tree Farm.
- g. Improve winter/spring elk habitat use areas as a high priority. Target forage enhancement projects in select natural and created openings to benefit elk.
- h. Augment elk where appropriate to bolster the population, and provide a younger age-structured herd to improve herd productivity.

- 3. *Objective:* Manage the North Rainier elk herd to ensure harvest does not exceed recruitment rates.

Problem: Hunting mortality at the current level is often additive to natural mortality contributing to the population decline documented for this elk herd. Except where desired to control damage concerns, antlerless elk

harvest should be minimal if the population is below herd objectives.

Strategies:

- a. Use available mortality, population estimate, and modeling data to set harvest limits for antlered elk and close hunting for antlerless elk if necessary.
- b. Work to establish cooperative harvest strategies with tribes in response to documented declines in elk numbers and when necessary establish conservation closures or other measures to meet population goals and objectives.

4. *Objective:* Promote and recognize viewing and photographic opportunities provided by this elk herd.

Problem: Elk population declines have reduced recreational viewing and photographic opportunities.

Strategies:

- a. Work with landowners and cooperators to designate and promote areas for public elk viewing on summer and winter range.
- b. Select and designate appropriate sites for winter range forage enhancement to benefit elk that will not significantly impact hunting objectives and can provide public viewing opportunities.
- c. Consider purchase of lands for elk viewing opportunities.

B. Habitat Management

1. *Objective:* Increase and improve habitat to allow elk to reach population objectives in the North Rainier Herd Plan.

Problem: Winter/spring habitat quality and quantity declines and nutritional limitations continue to be problematic for the short and long-term recovery of this elk herd. Body condition data indicate a summer range quality or quantity deficiency.

Strategies:

- a. Improve summer and winter/spring elk habitat use areas as a high priority. Identify and select natural and created openings to target for elk forage enhancement.
- b. Work with landowners to identify key winter/spring elk use areas, currently managed primarily for timber management, for opportunities to establish, maintain and improve elk forage potential.

- c. Assess and if effective maintain current road closures and work cooperatively to identify additional winter range road closure opportunities.
 - d. Work to reduce open road densities to one mi\ sq. mi. on elk winter range.
 - e. Explore the opportunity to promote controlled burning as a tool to enhance forage quality for elk
 - f. Continue to assess nutritional health of elk especially those associated with habitat improvement and relocation projects to determine measurable benefits in survival and /or calf recruitment.
2. *Objective:* Develop partnership opportunities to increase availability and improve quantity and quality of elk habitat on important sites.

Problem: Past forest management activities that created early successional forage habitats important to elk have declined.

Strategies:

- a. Secure management control of critical and preferred winter/spring habitat for elk through lease agreements, easements, landowner incentives, or fee purchase.
- b. Control noxious weeds on important elk forage sites.

IX Herd Augmentation (GMU 485 - Green River)

A. Background and Justification

GMU 485 (Green River) is within the original range of the Roosevelt elk (*Cervus elaphus roosevelti*), (McCall, 1996). The elk population in the Green River watershed appeared to peak in 1991 and has declined approximately 70% through 1999, (R. Spencer un. pub. data). The population decline is linked to poor recruitment of calves, the exact causes of which are unknown. Five hypotheses have been identified as possible: (1) predation; (2) human harvest of adult cow elk; (3) nutritional limitation resulting in chronically poor productivity; (4) density-dependent response as a result of declining food resources; and (5) or a combination of all of the above. These same factors have been implicated as potential contributors to the regional declines in elk productivity/recruitment.

Modeling of the Green River Elk Herd and preliminary information on female age structure suggests this is an old age population. Older age cows, older than 8 years, may be less productive (Greer 1966) and produce light weight calves. Older age structure of the adult female segment of the population in the North Rainier herd is probably affecting recruitment. Augmentation would add younger, more productive females to the population.

Currently, predation is the leading proximate cause suppressing the Green River elk population. This has contributed to poor recruitment which has compounded the problem. The current population estimate of 180 elk is well below the management objectives of approximately 500 elk for the Green River.

The augmentation proposal presents some challenges. The MIT has expressed concerns that augmentation will not work and may influence ongoing studies on elk nutrition and mortality. The timing and limited number of elk proposed for release will not significantly impact MIT studies. This proposal will permit collecting another full year of body condition information (fall 2001 and spring 2002) without the influence of transplanted elk in the population. WDFW estimates that there were approximately 220 elk present when the study was initiated in 1998. We expect this augmentation plan will have an immediate effect in stabilizing the declining elk population and reversing downward trend.

If we assume a minimal 85-90% pregnancy rate for twenty adult cows this will provide an additional 17-18 calves in the population at parturition. Modeling projections clearly identify augmentation as the most effective method to improve elk population demographics in the Green River.

B. Objective

Rebuild the Green River elk population primarily through augmentation and habitat improvement to achieve management objective of approximately 500 elk.

C. Release Site Description

1. Release areas:

a. McDonald Field - This site is located on the Green River in T. 20N., R. 8E., Section 35.

b. Maywood - This site is located on the Green River in T. 20N., R. 9E., Section 11.

2. Land ownership:

This pilot project will be coordinated with all landowners within GMU 485, other tribes, and the MIT. We have received written confirmation of support for augmentation from all landowners in GMU 485. Access to the Green River watershed is controlled by the City of Tacoma. Entrance into the area for hunting is by permit only and closely monitored. Management of wildlife resources is by cooperative agreement with the City of Tacoma, Washington Department of Fish and Wildlife, and Muckleshoot Indian Tribe.

There are about 142,000 acres in GMU 485 (Green River) and approximate landownership is presented in table 1.

Table 1. Land ownership and percent of total in GMU 485 (Green River).

<u>Landowner</u>	<u>Acreage</u>	<u>% of Total*</u>
Plum Creek Timber	52,746	37
Weyerhaeuser Company	8,365	5.9
Washington Department of Natural Resources	20,275	14
Gustina Timber Resources	15,315	10.5
U.S. Forest Service	30,582	21.0
City of Tacoma	15,115	15.0
Total	142,398	100

* approximate

3. Coordination and cooperation:

The primary organizations, companies, and agencies involved in this augmentation proposal are:

- Washington Department of Fish and Wildlife
- Eyes In The Woods
- Rocky Mountain Elk Foundation
- Plum Creek Timber
- Weyerhaeuser Company
- Washington Department of Natural Resources
- Justina Timber Resources
- U.S. Forest Service
- City of Tacoma
- Muckleshoot Indian Tribe

4. Site clearance

Site clearance for elk augmentation will be obtained prior to release of any animals. WDFW will obtain approval of the proposal from the land management agencies within GMU 485 (Green River).

D. Elk Capture and Transplanting

1. Source of stock and trap site locations:

Roosevelt elk (*Cervus elaphus roosevelti*) were indigenous to the western Cascade mountains. Remnant populations were augmented with Rocky

Mountain elk (*Cervus elaphus nelsoni*) in 1913.

Genetic characterization of the Green River elk population is currently underway. It is hoped that this work will enable the WDFW to differentiate Roosevelt and Rocky Mountain elk and to assess the degree to which particular herds may include genetic crosses. In addition the geographic structure and relatedness of various elk herds throughout the state will be determined. This information will be helpful to determine if a particular genetic stock is more desirable as a source herd.

2. Number and composition of elk to be transplanted:
Release 30 Roosevelt elk, about 20 cows and about 10 calves, between February and March 2002.
3. Disease testing:
City of Tacoma, Public Utilities have to be assured elk are free of disease and giardia that may affect water quality. Previous testing has demonstrated Washington elk are relatively free of disease and water quality will not be affected. Five random fecal samples will be taken from captured elk for testing to address water quality protection.

The standard protocol for disease monitoring will be employed. Serological samples will be sent to the State Department of Agriculture Laboratory for analysis. Disease testing will include Brucellosis, Leptospirosis, Epizootic Hemorrhagic Disease (EHD), Blue Tongue, Johnes disease and Anaplasmosis. In addition fecal samples will be tested using fecal flotation and Baermann tests for *Trichuris oocysts* and lungworm larvae. Tests will also be conducted for the presence of *Giardia*.

4. Trapping and transplanting:

Capture 30 Roosevelt elk (minimum 20 adult cows and yearlings and about 10 calves) either by chemical immobilization, net-gunning, or corral trap. The preferred source of transplant stock is from western Washington Roosevelt elk herds. The priority area is from the Olympic Peninsula followed by trap sites in the Willapa Hills, Julia Butler-Hanson Columbian White-tailed deer Refuge, and Mount St Helens elk populations.

There are three preferred source populations: Chehalis Valley (100-150 elk), Moxie/ Chehalis (30-40 elk), and Matlock area (80 elk). Elk in these areas have increased beyond management objectives. Hunting opportunity has been expanded, however elk numbers continue to increase because private landowners limit hunter access due to safety concerns.

Despite liberalized seasons current harvest is not sufficient to stabilize these populations. Hunting combined with capture and relocation is a valid option to manage these elk.

Volunteers will be enlisted from wildlife conservation organizations including Eyes In The Woods, and the Rocky Mountain Elk Foundation (RMEF). In the past members from both these organizations have volunteered use of labor and personal stock trailers for capture and transportation of elk. The release may involve 5-6 animals at a time over the designated release period or all animals may be captured and released at once.

5. Elk condition and pregnancy testing:
Ultrasonography will be used to determine if captured elk are pregnant, and evaluate body condition. Age of all elk captured will be determined.

E. Monitoring of Released Elk

1. Elk identification:
Radio telemetry transmitters will be put on a minimum of 10 adult females. Remaining elk will be marked with plastic, color coded, numbered ear tags. Age and sex of all elk captured elk will be recorded.
2. Schedule of monitoring:
Radio collared elk will be monitored at least once weekly for approximately 12 months using WDFW staff, volunteers, City of Tacoma Watershed Inspectors, and the Muckleshoot Indian Tribe (MIT) (if they agree). After the initial release (the first four months) elk will be monitored a minimum of twice per week. Elk will be monitored primarily by ground surveys, but also from the air particularly if animals disperse from the release area.

Dispersal and mortality of transplant elk is a potential. Stussy et al., (1994) reported a mean annual survival rate of 0.77 for relocated adult female elk in the northwest Oregon Cascades. The major cause of mortality was unknown; however, poaching was suspected as a potential cause. Because of limited public access and no elk hunting in GMU 485, we estimated survival will range between 0.80-0.85 for adult females. Transplanted elk will “acclimate” to the area following release relatively free from disturbance. During and following the release period, steep topography and snow at higher elevations will restrict elk movements until cows are within 1-1.5 months of parturition. We believe this will reduce dispersal and enhance establishment of home range as transplanted animals intermix with resident elk. The time of release should correspond to the spring “green up”so animals will find early emergent vegetation. The availability

of early successional forage may provide an additional incentive for elk to stay put.

A detailed record of elk movements during the year will be maintained. All marked elk mortalities will be recorded and cause of death determined.

F. Discussion

1. Elk damage contingency:

There are no elk damage concerns expressed by timber landowners in the Green River unit. In the event that released elk wander and cause damage within or adjacent to GMU 485 (Green River) we will haze or herd elk out of problem areas. Hazing elk may be accomplished on foot or by aircraft. Elk will be removed by holding special damage hunts, hot spot hunts, special permit hunts, extended seasons, late seasons, or issuing kill permits.

Formal damage complaints resulting from augmentation will be handled as per WDFW policy and procedures. If serious chronic damage problems result from transplanted elk within GMU 485 or elsewhere, they will be addressed with increased harvest strategies.

2. Cost analysis:

Helicopter capture chemical immobilization

- Helicopter cost/ animal - \$550.
- Capture drugs cost/ animal - \$25 - \$100.
- Disease testing cost/animal - \$20.

Helicopter capture net gunning

- Helicopter cost/animal - \$550.
- Disease testing cost/animal - \$20.

Corral trapping

- Personnel time - Cost/animal (\$100-\$500)
- Disease testing cost/animal - \$20.

Transportation to release site

- Use of volunteers and their transport truck and trailers
- Per diem costs - \$90/day/person.

Animal identification and monitoring

- Ear tags - \$100.
- Radio telemetry transmitter collars - \$300. each X 10 = \$3,000.
- Volunteer monitoring - No cost.
- Flight time (fixed-wing telemetry) follow-up - \$175./hour X 48 hrs = \$8,400.

3. Estimated total cost comparing three elk capture methods:

Table 9 Estimated cost of trapping and transplanting 30 elk using three methods.

Details	Helicopter Immobilization	Helicopter net-gunning	Corral Bait Trapping
helicopter	\$16,500.00	16,500.00	\$0.00
drugs	\$3,000.00	\$500.00	\$500.00
disease testing	\$600.00	\$600.00	\$600.00
per diem (n20 X \$90)	\$1,800.00	\$1,800.00	\$1,800.00
labor trapping (volunteers)	\$0.00	\$0.00	\$0.00
bait/baiting (volunteers)			\$0.00
construct trap(volunteers)			\$0.00
transport (volunteers)	\$0.00	\$0.00	\$0.00
radios/ear tags	\$3,100.00	\$3,100.00	\$3,100.00
monitor aircraft (25hrs)	\$8,400.00	\$8,400.00	\$8,400.00
part time labor follow-up	\$15,000.00	\$15,000.00	\$15,000.00
Total	\$48,400.00	\$45,900.00	\$29,400.00

G. Timeline

Initial augmentation is scheduled for February and March 2002. Following evaluation of the pilot project, future augmentations in 2003 and 2004 will be considered to meet population objectives.

X Spending Priorities

A. Population Estimation (mark recapture surveys):

Continue periodic independent population estimator studies on an as need basis for sub-herds in the North Rainier elk herd area. This should be supplemented with POP II modeling, sightability surveys and other techniques if justified.

Priority: High

Timeline: Every 3- 5 year period, or on an as needed basis.

Cost: \$16,750. Thirty (30) hours of flight time for mark- recapture estimates (525.00 per hour) and \$1000.00 for materials.

B. Pre and Post Hunting Season Herd Composition Surveys:

Continue pre and post hunting season composition flights as part of the population trend flights in fall and winter in GMU 653 (White River). Conduct fall and winter/spring population index flights to monitor population size. Expand composition flights to GMU 460 (Snoqualmie) to start monitoring this population.

Priority: High

Timeline: Annual flights

Cost: \$11,500. The estimated costs are related to helicopter flight time of 20 hours/year for fall and winter flights at \$525/ hour).

- C. Monitor Recreational and Tribal Harvest:** Increase the precision and accuracy of tribal and recreational harvest estimation from the North Rainier herd.

Priority: High

Timeline: Ongoing

Cost: Estimated \$10,000 annually.

- D. Habitat Enhancement on Primary Summer and Winter Range:**

The key components and essential foundation to recovering this elk herd are:

1. Inventory crucial and traditional winter range forage sites.
2. Partnership habitat improvements with appropriate landowners.
3. Implement and monitor elk forage enhancement projects.

Priority: High

Timeline: Start winter of 2000, then on-going.

Cost: \$10,000 annually for the next 5 years.

- E. Elk Augmentation to the North Rainier Herd Area:**

Elk augmentation is proposed for GMU 485 (Green River) as a priority site to improve antlerless age structure and possibly increase recruitment. Other potential augmentation sites include GMU 460 (Snoqualmie), and if determined necessary GMU 653 (White River).

Priority: Moderate

Timeline: Start trapping in February-March 2002, and monitor released animals for approximately two years.

Cost: \$96,800.00 total. First year \$48,400. Second year \$48,400. (Helicopter immobilization)

XI Herd Plan Review and Amendment

The North Rainier Elk Herd Plan is a five-year document subject to annual review and amendment. As new information is gathered and conditions change, it will be necessary to maintain a free exchange of communication between WDFW, Tribes, and cooperators. An annual review of the plan by WDFW will be announced and new information and emergent issues shared with all cooperators.

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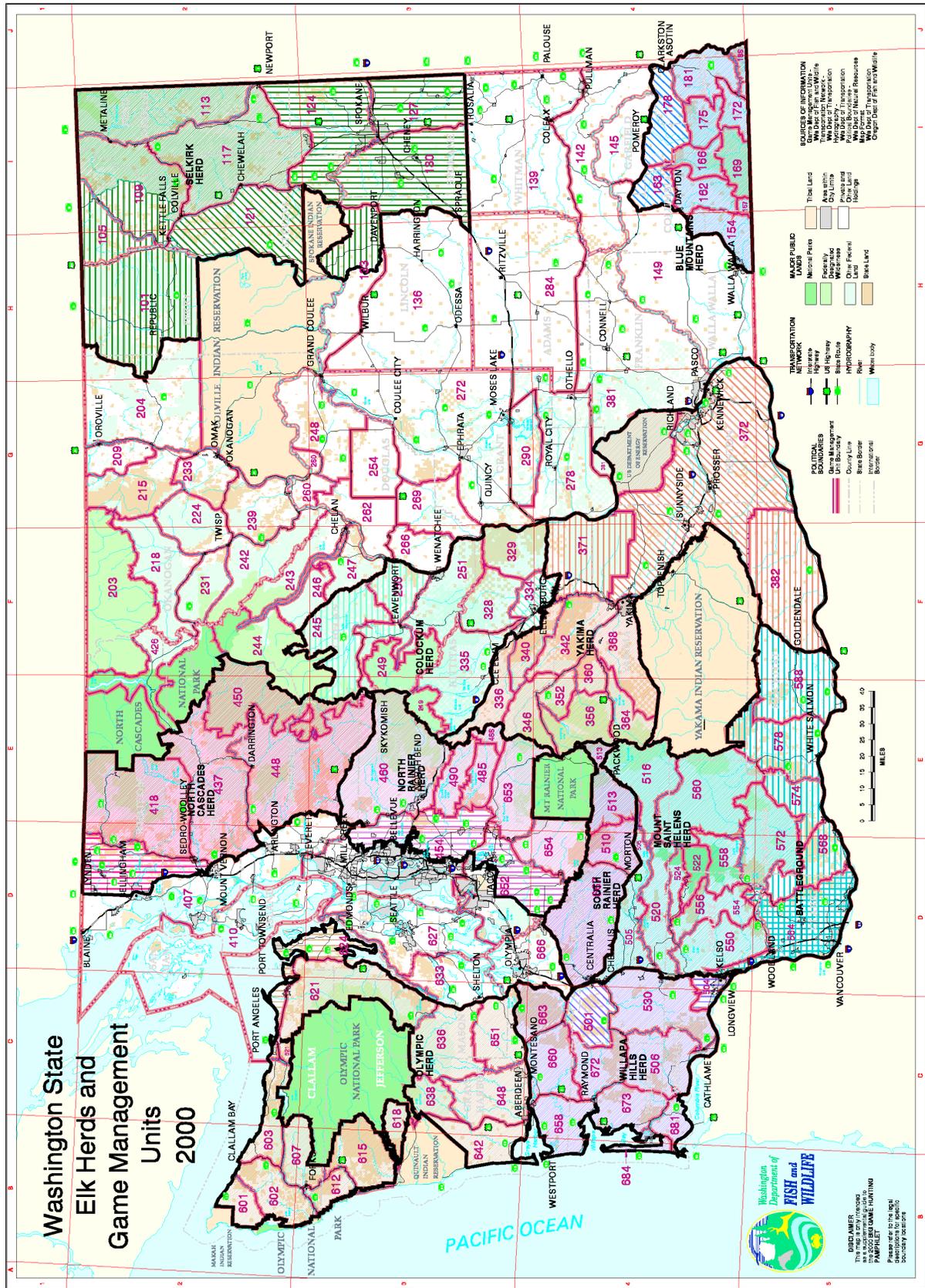
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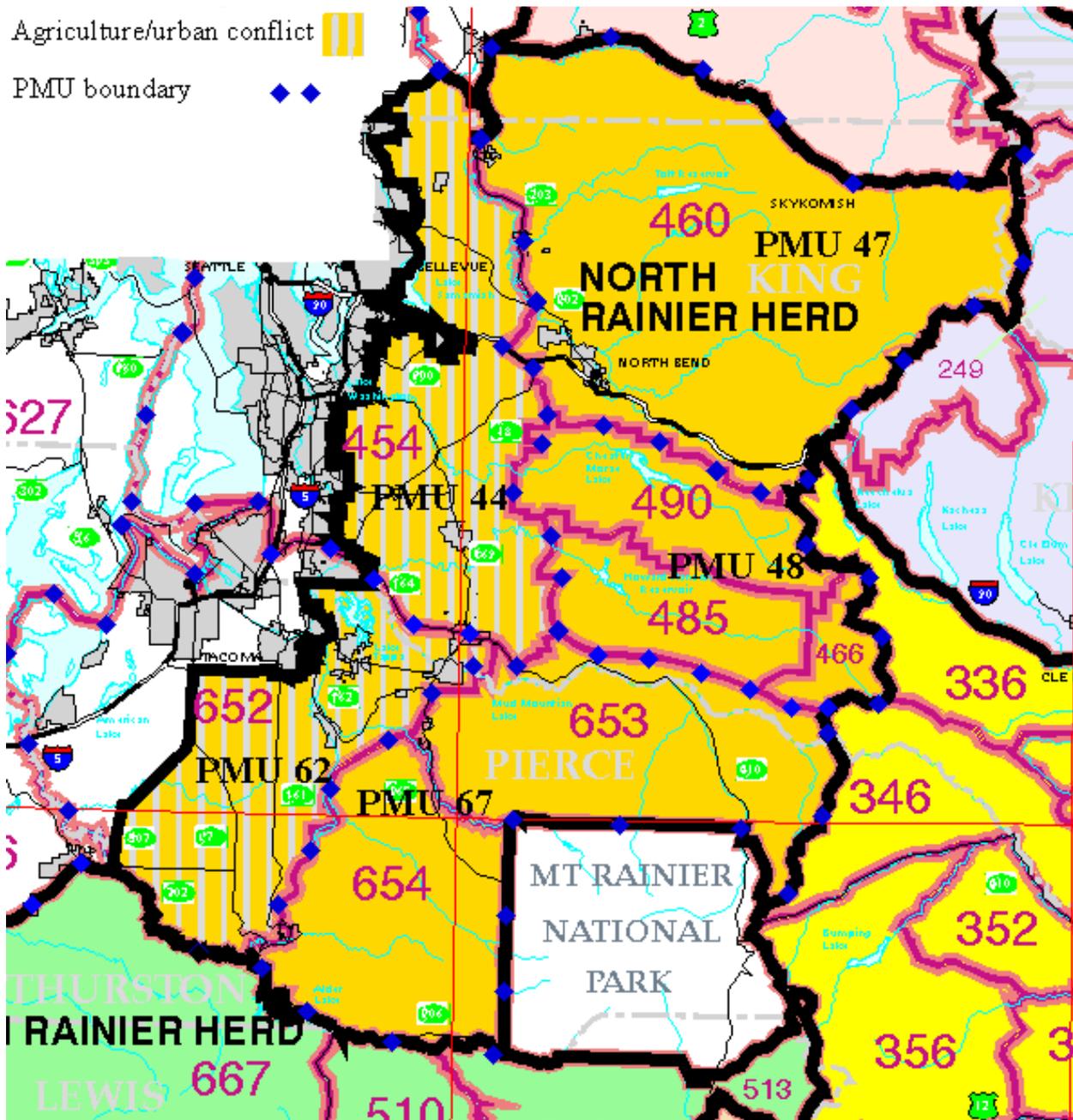
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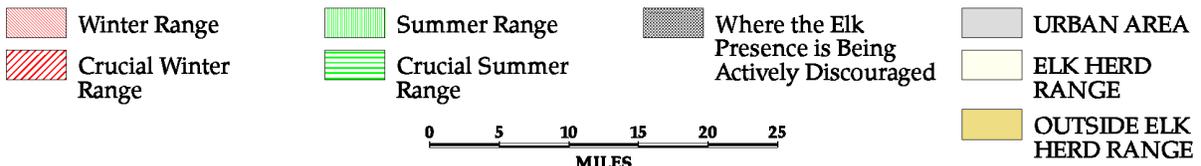
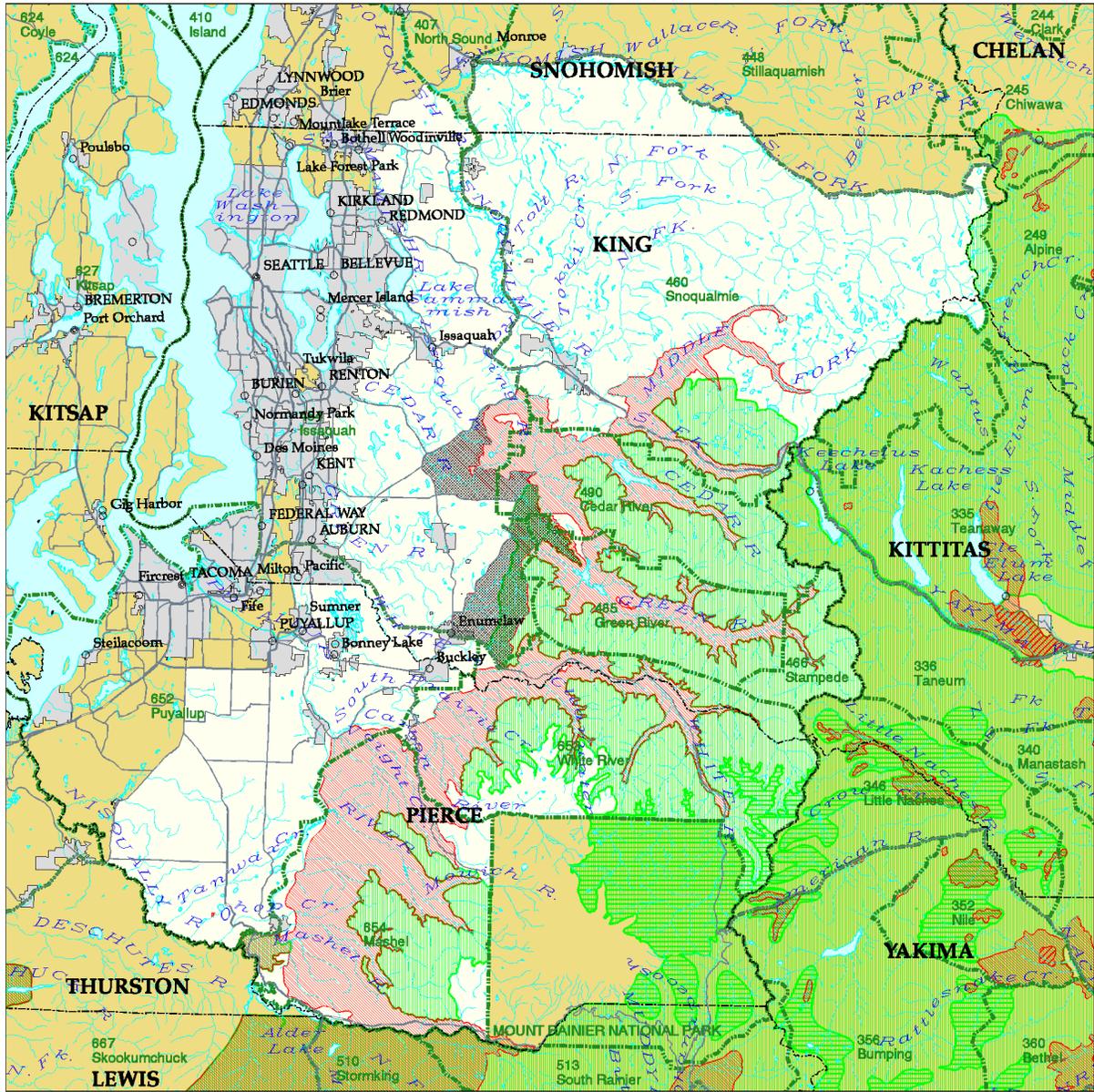
APPENDIX A North Rainier Elk Herd Location in Western Washington



APPENDIX B The North Rainier Elk Herd Area



APPENDIX C North Rainier Elk Herd Distribution



APPENDIX D GMU 485 (Green River) Harvest Quota Distribution and Permit Type

Year	Permit distribution	either-sex 5 pt min	branched antlered bull	3pt min or antlerless	spike bull	spike or antler- less	antler- less	cow	Total
2000	Closed								0
1999	Closed								0
1998	Closed								0
1997	Closed								0
1996	State	0	11	0	1	32	0	5	49
	MIT	0	2	0	6	0	35	0	43
	year total	0	13	0	7	32	35	5	92
1995	State	0	12	0	2	38	0	5	57
	MIT	0	2	0	6	0	35	0	43
	year total	0	14	0	8	38	35	5	100
1994	State	0	15	0	5	25	0	5	50
	MIT	0	6	0	6	0	19	0	31
	year total	0	21	0	11	25	19	5	81
1993	State	0	15	0	5	25	0	5	50
	MIT	0	0	0	6	0	9	0	15
	year total	0	15	0	11	25	19	5	81
1992	State	0	15	0	5	25	0	5	50
	MIT	0	0	0	6	0	9	0	15
	year total	0	15	0	11	25	9	5	65
1991	State	0	0	15	5	0	30	0	50
1990	State	0	0	15	5	0	30	0	50
1989	State	0	0	15	5	0	30	0	50
1988	State	15	0	0	5	0	30	0	50
1987	State	0	0	20	0	0	30	0	50
1986	State	0	0	20	0	0	30	0	50
1985	State	0	0	30	0	0	20	0	50
1984	State	0	0	20	0	0	0	0	20
1983	State	0	0	20	0	0	0	0	20

APPENDIX E Reported Tribal Harvest From the North Rainier Herd Area

Year	Bull	Cow	Unknown	Total
1988	1	43	-	44
1989	6	21	10	37
1990	18	36	18	72
1991	22	60	-	82
1992	11	48	-	59
1993	0	4	-	4
1994	50	110	-	160
1995	0	27	-	27
1996	4	9	-	13
1997	26	31	-	57
1998	30	12	-	42
1999				
2000				

APPENDIX F Elk Hunting Season's in the North Rainier Herd Area

YEAR	GMU & Permit (#s)	DATES	DAYS	LEGAL ANIMAL	HUNT DESCRIPTION AND TAG TYPE
2001	454. 407, 652, 654. 460, 466, 653.	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14	Any Elk 3 pt. Min. or Antlerless 3 Pt. Minimum	Early Archery General (WA)
	454. 407. 652.	11/21- 12/15 11/21 - 12/15 11/21 - 12/15	25 25 25	Any Elk 3 pt. Min. or Antlerless 3 pt. Minimum	Late Archery General (WA)
	454. 460, 652, 654, 660.	10/06 - 10/12 10/06 - 10/12	7 7	Any Elk 3 Pt. Minimum	Early Muzzleloader General (WM)
	454. 652.	11/21 - 12/15 11/21 - 12/15	25 25	Any Elk 3 Pt. Minimum	Late Muzzleloader General (WM)
	454. 407, 460, 466, 652, 653, 654.	11/03 - 11/11 11/03 - 11/11	9 9	Any Bull 3 Pt. Minimum	Modern Firearm General (WF)
	654 Kapowsin bull North (2). 654 Kapowsin bul Central (2). 654 Kapwosin bull South (2).	09/14 - 09/29 09/14 - 09/29 09/14 - 09/29	16 16 16	Any Bull Any Bull Any Bull	PLWMA Auction/Raffle Hunt (Any Tag)
2000	454. 407, 652, 654, 660 460, 466, 653.	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14	Any Elk 3 pt. Min. or Antlerless 3 Pt. Minimum	Early Archery General (WA)
	407, 652. 454.	11/22 - 12/15 11/22 - 12/15	24 24	3 pt. Min. or Antlerless Any Elk	Late Archery General (WA)
	454. 460, 652, 654, 660.	10/07 - 10/13 10/07 - 10/13	7 7	Any Elk 3 Pt. Minimum	Early Muzzleloader General (WM)
	454. 484.	11/22 - 12/15 11/22 - 12/15	24 24	Any Elk 3 Pt. Minimum	Late Muzzleloader General (WM)
	454. 460, 466, 472, 478, 484, 490.	11/04 - 11/12 11/04 - 11/14	9 9	Any Bull 3 Pt. Minimum	Modern Firearm General (WF)
	654 Kapowsin bull North (2). 654 Kapowsin bul Central (2). 654 Kapwosin bull South (2).	09/15 - 09/30 09/15 - 09/30 09/15 - 09/30	16 16 16	Any Bull Any Bull Any Bull	PLWMA Auction/Raffle Hunt (Any Tag)
1999	454. 460, 484, 490. 466, 472, 478.	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14	Any Elk 3 pt. Min. or Antlerless 3 Pt. Minimum	Early Archery General (WA)
	484. 454.	11/24 - 12/15 11/24 - 12/15	22 22	3 pt. Min. or Antlerless Any Elk	Late Archery General (WA)
	454. 460, 478, 484.	10/09 - 10/15 10/09 - 10/15	6 6	Any Elk 3 Pt. Minimum	Early Muzzleloader General (WM)
	454. 484.	11/24 - 12/15 11/24 - 12/15	22 22	Any Elk 3 Pt. Minimum	Late Muzzleloader General (WM)
	454. 460, 466, 472, 478, 484, 490.	11/06 - 11/14 11/06 - 11/14	9 9	Any Bull 3 Pt. Minimum	Modern Firearm General (WF)
	478 Kapowsin bull North (2). 478 Kapowsin bul Central (2). 478 Kapwosin bull South (2).	09/15 - 09/30 09/15 - 09/30 09/15 - 09/30	16 16 16	Any Bull Any Bull Any Bull	PLWMA Auction/Raffle Hunt (Any Tag)
1998	454. 460, 466, 490. 472, 478, 484. Champion PLWMA 401 (3)	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 08/28 - 09/10	14 14 14 14	Any Elk 3 pt. Min. or Antlerless 3 Pt. Minimum Antlerless Only	Early Archery General (WA) Harvest quota of 3 in PLWMA 401

	454. 484	11/25 - 12/15 11/25 - 12/15	21 21	Any Elk 3 Pt. Minimum	Late Archery General (WA)
	454. 460, 484.	10/10 - 10/16 10/10 - 10/16	7 7	Any Elk 3 Pt. Minimum	Early Muzzleloader General (WM)
	454. 484.	11/25 - 12/15 11/25 - 12/15	21 21	Any Elk 3 Pt. Minimum	Late Muzzleloader General (WM)
	454. 460, 466, 472, 478, 484, 490.	11/07 - 11/15 11/07 - 11/15	9 9	Any Bull 3 Pt. Minimum	Modern Firearm General (WG)
	478 Kapowsin bull North (2). 478 Kapowsin bul Central (2). 478 Kapwosin bull South (2).	09/15 - 09/30 09/15 - 09/30 09/15 - 09/30	16 16 16	Any Bull Any Bull Any Bull	PLWMA Auction/Raffle Hunt (Any Tag)
1997	454, 484. 460, 466, 478, 490.	09/01 - 09/14 09/01 - 09/14	14 14	Any Elk 3 Pt. Min. or Antlerless	Early Archery General (WA)
	454, 484.	11/26 - 12/15	21	Spike or Antlerless	Late Archery General (WA)
	454, 484. 460, 478	10/04 - 10/10 10/04 - 10/10	6 6	Spike bull or Antlerless 3 Pt. Minimum	Early Muzzleloader General (WM)
	454, 484.	11/26 - 12/15	22	Spike Bull or Antlerless	Late Muzzleloader General (WM)
	454, 484. 460, 466, 478, 490.	11/08 - 11/16 11/10 - 11/16 11/08 - 11/16 11/10 - 11/16	9 7 9 7	Spike Bull Only Spike Bull Only 3 Pt. Minimum 3 Pt. Minimum	Modern Firearm General (WG) Modern Firearm General (WP) Modern Firearm General (WG) Modern Firearm General (WP)
	478 Kapowsin bull North A (2).	09/13 - 09/24	12	Any Bull	PLWMA Auction/Raffle Hunt (Any Tag)
	478 Kapowsin North C (10). 478 Kapowsin Central B (5). 478 Kapwosin South B (5).	11/24 - 12/08 11/24 - 12/08 11/24 - 12/08	14 14 14	Antlerless Only Antlerless Only Antlerless Only	Muzzleloader Only PLWMA auction/raffle Hunt (WM)
	White River A (330) White River B (25) White River C (5) White River D (102) White River E (11) White River F (67) White River G (26)	11/03 - 11/16 11/03 - 11/16 11/12 - 11/16 10/01 - 10/10 10/01 - 10/10 09/01 - 09/14 09/01 - 09/14	14 14 5 10 10 14 14	Spike Only 3 Pt. Minimum Antlerless Only Spike Only 3 Pt. Minimum Spike Only 3 Pt. Minimum	Modern Firearm Permit Only (WP) Modern Firearm Permit Only (WP) Modern Firearm Permit Only (WP or WM) Muzzleloader Permit Only (WM) Muzzleloader Permit Only (WM) Archery Permit Only (WA) Archery Permit Only (WA)
1996	454, 484. 460, 466, 478, 490. 472. Champion PLWMA 401	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 09/01 - 09/13	14 14 14 13	Either-sex 3 Pt. Min. or Antlerless Spike or Antlerless Spike or Antlerless	Early Archery General (WA) PLWMA 401 in GMU 478.
	454, 484.	11/27 - 12/15	19	Either-sex	Late Archery General (WA)
	484. 460.	10/03 - 10/09 10/03 - 10/09	6 6	Either-sex 3 Pt. Minimum	Early Muzzleloader General (WM)
	484.	11/27 - 12/15	21	Either-sex	Late Muzzleloader General (WM)
	454, 472*, 484	11/06 - 11/17 11/09 - 11/17	12 9	Antlered Bull (except 472 Spike only).	Modern Firearm General (WG) Modern Firearm General (WP)
	460, 466 478, 490.	11/08 - 11/16 11/10 - 11/16	12 9	3 Pt. Minimum 3 Pt. Minimum	Modern Firearm General (WG) Modern Firearm General (WP)
	478 Kapowsin bull A (2). 478 Kapowsin bull B (1). 478 Kapowsin bull C (1).	Three seasons to match tag holders.	13 arch. 9 M.F. 11 Muz.	Any Bull	PLWMA Auction/Raffle Hunt (Any Tag) Archery Sept. 1-13; Mod. F. Nov. 9-17; Muz. Nov.21-Dec. 1
	478 Kapowsin Spike D (1) 478 Kapowsin Spike E (1) 478 Kapowsin Spike F (1) 478 Kapowsin Spike G (1)	11/09 - 11/17 11/09 - 11/17 11/21 - 12/01 11/21 - 12/01	9 9 11 11	Spike Bull	Champion Spike Bull Permit Only (WG & WP) Champion Spike Bull Permit Only (WG & WP) Champion Spike bull Permit Only (WM) Champion Spike bull Permit Only (WM)

	478 Kapowsin North A (10). 478 Kapowsin Central B (5). 478 Kapowsin South C (5).	11/24 - 12/08 11/24 - 12/08 11/24 - 12/08	14 14 14	Antlerless Only Antlerless Only Antlerless Only	Muzzleloader Only PLWMA auction/raffle Hunt (WM)
	White River A (25) White River B (10) Green River Cow A (32) Green River Bull (11) Green River Spike (1) Green River Cow B (5)	11/06 - 11/17 09/01 - 09/14 11/09 - 11/13 11/09 - 11/13 11/09 - 11/13 11/01 - 11/13	12 14 5 5 5 5	Any Bull Either-sex Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless Antlerless Only	Modern Firearm Permit Only (WP or WM) Archery Permit Only (WA) Modern Firearm Permit Only (WP or WM) Modern Firearm Permit Only (WP or WM) Modern Firearm Permit Only (WP or WM) Person of Disability Permit Only (Any Elk Tag)
1995	454, 484. 460, 466, 478, 490. 472. Champion PLWMA 401	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14 14	Either-sex 3 Pt. Min. or Antlerless Spike or Antlerless Spike or Antlerless	Early Archery General (WA) PLWMA 401 in GMU 478.
	454, 484.	11/22 - 12/15	24	Either-sex	Late Archery General (WA)
	484. 460. 478 Champion PLWMA	10/05 - 10/11 10/05 - 10/11	7 7	Either-sex 3 Pt. Minimum Spike Bull Only	Early Muzzleloader General (WM)
	484.	11/22 - 12/15	24	Either-sex	Late Muzzleloader General (WM)
	454, 472*, 484	11/01 - 11/13 11/04 - 11/13	13 10	Antlered Bull (except 472 Spike only).	Modern Firearm General (WG) Modern Firearm General (WP)
	460, 466 478, 490, and Champion PLWMA	11/01 - 11/13 11/04 - 11/13	13 10	3 Pt. Minimum (except PLWMA spike only).	Modern Firearm General (WG) Modern Firearm General (WP)
	478 Kapowsin bull A (2). 478 Kapowsin bull B (2).	Three seasons to match tag holders.	13 arch. 9 M.F. 11 Muz.	Any Bull	PLWMA Permit Drawing(Raffle) Hunt (WA,WC,WM)Archery Sept. 1-14; Mod. F. Nov. 1-13; Muz. Nov.22-Dec. 5
	478 Kapowsin North A (10). 478 Kapowsin Central B (5). 478 Kapowsin South C (5).	11/22 - 12/05 11/22 - 12/05 11/22 - 12/05	14 14 14	Antlerless Only Antlerless Only Antlerless Only	Muzzleloader Only PLWMA raffle Hunt (WM)
White River A (25) White River B (10) Green River Cow A (38) Green River Bull (12) Green River Spike (2) Green River Cow B (5)	11/01 - 11/13 09/01 - 09/14 11/11 - 11/15 11/11 - 11/15 11/11 - 11/15 11/11 - 11/15	13 14 5 5 5 5	Any Bull Either-sex Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless Antlerless Only	Modern Firearm Permit Only (WC or WM) Archery Permit Only (WA) Modern Firearm Permit Only (WC or WM) Modern Firearm Permit Only (WC or WM) Modern Firearm Permit Only (WC or WM) Person of Disability Permit Only (WC or WM)	
1994	454, 484. 460, 466, 478, 490. 472. Champion PLWMA 401	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14 14	Either-sex 3 Pt. Min. or Antlerless Spike or Antlerless Spike or Antlerless	Early Archery General (WA) PLWMA 401 in GMU 478.
	454, 484.	11/23 - 12/15	23	Either-sex	Late Archery General (WA)
	484. 460.	10/06 - 10/12 10/06 - 10/12	7 7	Either-sex 3 Pt. Minimum	Early Muzzleloader General (WM)
	484. 478 Champion PLWMA	11/23 - 12/15 11/23 - 12/05	23 13	Either-sex Spike Bull Only	Late Muzzleloader General (WM)
	454, 472*, 484	11/02 - 11/13 11/05 - 11/13	12 09	Antlered Bull (except 472 Spike only).	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466 478, 490 and Champion PLWMA.	11/02 - 11/13 11/05 - 11/13	12 09	3 Pt. Minimum, except PLWMA Spike Bull Only.	Modern Firearm General (WE) Modern Firearm General (WL)
	478 Kapowsin bull A (2). 478 Kapowsin bull B (2).	Three seasons to match tag holders.	13 arch. 9 M.F. 11 Muz.	Any Bull	PLWMA Permit Drawing(Raffle) Hunt (WA,WL,WM) Archery Sept. 1-14; Mod. F. Nov. 1-13; Muz. Nov.22-Dec. 5
	478 Kapowsin North A (10). 478 Kapowsin Central B (5). 478 Kapowsin South C (5).	11/22 - 12/05 11/22 - 12/05 11/22 - 12/05	14 14 14	Antlerless Only Antlerless Only Antlerless Only	Muzzleloader Only PLWMA raffle Hunt (WM)

	White River A (25) White River B (10) Green River Cow A (25) Green River Bull (15) Green River Spike (5) Green River Cow B (5)	11/02 - 11/13 09/01 - 09/14 11/12 - 11/16 11/12 - 11/16 11/12 - 11/16 11/12 - 11/16	12 14 5 5 5 5	Any Bull Either-sex Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless Antlerless Only	Modern Firearm Permit Only (WL or WM) Archery Permit Only (WA) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Person of Disability Permit Only (WL or WM)
1993	454. 460, 466, 478, 490. 472. Champion PLWMA 401	10/01 - 10/14 10/01 - 10/14 10/01 - 10/14 10/01 - 10/14	14 14 14 14	Either-sex 3 Pt. Min. or Antlerless Spike or Antlerless Spike or Antlerless	Early Archery General (WA) PLWMA 401 in GMU 478.
	454, 484.	11/23 - 12/15	23	Either-sex	Late Archery General (WA)
	484. 460.	10/08 - 10/14 10/08 - 10/14	7 7	Either-sex 3 Pt. Minimum	Early Muzzleloader General (WM)
	484. 478 Champion PLWMA	11/24 - 12/15 11/24 - 12/05	22 12	Either-sex Spike Bull Only	Late Muzzleloader General (WM)
	454, 472*, 484	11/03 - 11/14 11/06 - 11/14	12 09	Antlered Bull (except 472 Spike only).	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466 478, 490 and Champion PLWMA.	11/03 - 11/14 11/06 - 11/14	12 9	3 Pt. Minimum, except PLWMA Spike Bull Only.	Modern Firearm General (WE) Modern Firearm General (WL)
	478 Kapowsin North (60). 478 Kapowsin Central (25). 478 Kapowsin South (25).	11/24 - 12/05 11/24 - 12/05 11/24 - 12/05	12 14 14	Spike bull or antlerless	Muzzleloader Only PLWMA raffle Hunt (WM)
	White River A (25) White River B (10) Green River Cow A (25) Green River Bull (15) Green River Spike (5) Green River Cow B (5)	11/03 - 11/14 10/01 - 10/14 11/13 - 11/17 11/13 - 11/17 11/13 - 11/17 11/13 - 11/17	12 14 5 5 5 5	Any Bull Either-sex Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless Antlerless Only	Modern Firearm Permit Only (WL or WM) Archery Permit Only (WA) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Person of Disability Permit Only (WL or WM)
1992	454. 460, 466, 478, 490. 472.	10/01 - 10/14 10/01 - 10/14 10/01 - 10/14	14 14 14	Either-sex 3 Pt. Min. or Antlerless Spike or Antlerless	Early Archery General (WA)
	454, 484.	11/25 - 12/15	21	Either-sex	Late Archery General (WA)
	484. 460.	10/08 - 10/14 10/08 - 10/14	7 7	Either-sex 3 Pt. Minimum	Early Muzzleloader General (WM)
	484.	11/25 - 12/15	21	Either-sex	Late Muzzleloader General (WM)
	454, 472*, 484.	11/04 - 11/15 11/07 - 11/15	12 09	Antlered Bull (except 472 Spike only).	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466 478, 490.	11/04 - 11/15 11/07 - 11/15	12 09	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
	White River A (25) White River B (5) Green River Cow A (25) Green River Bull (15) Green River Spike (5) Green River Cow B (5)	11/04 - 11/15 10/01 - 10/14 11/14 - 11/18 11/14 - 11/18 11/14 - 11/18 11/14 - 11/18	12 14 5 5 5 5	Any Bull Either-sex Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless Antlerless Only	Modern Firearm Permit Only (WE or WM) Archery Permit Only (WA) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Person of Disability Permit Only (WL or WM)
1991	454. 460, 466, 478, 490. 484. 472.	09/28 - 10/11 09/28 - 10/11 09/28 - 10/04 09/28 - 10/11	14 14 7 14	Either-sex 3 Pt. Min. or Antlerless Either-sex 3 pt. Minimum	Early Archery General (WA)
	454, 484.	11/27 - 12/15	19	Either-sex	Late Archery General (WA)
	484. 460.	10/05 - 10/11 10/05 - 10/11	7 7	Either-sex 3 Pt. Minimum	Early Muzzleloader General (WM)
	484.	11/27 - 12/15	19	Either-sex	Late Muzzleloader General (WM)

	454, 484	11/06 - 11/17 11/09 - 11/17	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)	
	460, 466, 472, 478, 490.	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)	
	Green River Cow A (30) Green River Bull (15) Green River Spike (5)	11/16 - 11/20 11/16 - 11/20 11/16 - 11/20	5 5 5	Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)	
1990	454. 460, 466, 478, 490. 484. 472.	09/29 - 10/12 09/29 - 10/12 09/29 - 10/05 09/29 - 10/12	14 14 7 14	Either-sex 3 Pt. Min. or Antlerless Either-sex 3 pt. Minimum	Early Archery General (WA)	
	454, 484.	11/21 - 12/09	19	Either-sex	Late Archery General (WA)	
	484.	10/06 - 10/12	7	Either-sex	Early Muzzleloader General (WM)	
	484.	11/21 - 12/09	19	Either-sex	Late Muzzleloader General (WM)	
	454, 484	10/31 - 11/11 11/03 - 11/11	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)	
	460, 466, 472, 478, 490.	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)	
	485 Green River Cow A (30) 485 Green River Bull (15) 485 Green River Spike (5)	11/16 - 11/20 11/16 - 11/20 11/16 - 11/20	5 5 5	Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)	
	1989	454. 460, 466, 478, 490. 484. 472.	09/30 - 10/13 09/30 - 10/13 09/30 - 10/06 09/30 - 10/13	14 14 7 14	Either-sex 3 Pt. Min. or Antlerless 3 Pt. Min. or Antlerless 3 pt. Minimum	Early Archery General (WA)
		484.	11/22 - 12/15	24	3pt. Min. or Antlerless	Late Archery General (WA)
		484.	10/07 - 10/13	7	3pt. Min or Antlerless	Early Muzzleloader General (WM)
484.		11/22 - 12/10	19	3pt. Min. or Antlerless	Late Muzzleloader General (WM)	
454, 484		11/01 - 11/12 11/04 - 11/12	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)	
460, 466, 472, 478, 490.		11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)	
485 Green River Cow A (30) 485 Green River Bull (15) 485 Green River Spike (5)		11/11 - 11/15 11/11 - 11/15 11/11 - 11/15	5 5 5	Antlerless Only 3 Pt. Min. or Antlerless Spike or Antlerless	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)	
1988		454, 484. 460, 466, 472, 478, 490.	10/01 - 10/14 10/01 - 10/14	14 14	Either-sex 3 Pt. Min. or Antlerless	Early Archery General (WA)
		484.	11/23 - 12/11	19	Either-sex	Late Archery General (WA)
		484.	10/07 - 10/13	7	3pt. Min or Antlerless	Early Muzzleloader General (WM)
	484.	11/22 - 12/10	19	3pt. Min. or Antlerless	Late Muzzleloader General (WM)	
	454, 484	11/02 - 11/13 11/05 - 11/13	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)	
	460, 466, 472, 478, 490.	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)	

	485 Green River Cow A (30) 485 Green River Bull (15) 485 Green River Spike (5)	11/12 - 11/16 11/12 - 11/16 11/12 - 11/16	5 5 5	Antlerless Only Either-sex, 5 Pt. Bull Min. Spike or Antlerless	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)
1987	454, 484. 460, 466, 472, 478, 490.	10/01 - 10/16 10/01 - 10/16	14 14	Either-sex 3 Pt. Min. or Antlerless	Early Archery General (WA)
	484.	11/25 - 12/10	16	Either-sex	Late Archery General (WA)
	454, 484	11/04 - 11/15 11/07 - 11/15	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490.	11/04 - 11/15 11/07 - 11/15	12 9	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow A (30) 485 Green River Bull (20)	11/14 - 11/18 11/14 - 11/18	5 5	Antlerless Only Antlerless or 3 pt. Min.	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)
1986	454, 460, 466, 472, 478 484, 496.	09/03 - 09/07 09/08 - 09/17	5 10	Bull Only Either-sex	Early Archery General
	454, 484, 496.	12/06 - 12/31	26	Either-sex	Late Archery General
	472	11/05 - 11/16	12	Bull Only	Western Washington Muzzleloader Season
	454, 484	11/05 - 11/16 11/08 - 11/16	12 9	Either-sex	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490.	11/04 - 11/15 11/07 - 11/15	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow A (30) 485 Green River Bull (20)	11/25 - 11/30 11/25 - 11/30	5 5	Antlerless Only Antlerless or 3 pt. Min.	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)
1985	454, 460, 466, 472, 478 484, 496.	09/04 - 09/08 09/09 - 09/18	5 10	Bull Only Either-sex	Early Archery General
	454, 484, 496.	12/07 - 12/31	25	Either-sex	Late Archery General
	472	11/06 - 11/17	12	Bull Only	Western Washington Muzzleloader Season
	454, 484	11/09 - 11/17	12	Either-sex	Modern Firearm General (WE)
	460, 466, 472, 478, 490.	11/06 - 11/17 11/09 - 11/17	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow A (20) 485 Green River Bull (30) 496 Ohop (15).	11/26 - 12/01 11/26 - 12/01 11/30 - 12/08	6 6 9	Antlerless Only Antlerless or 3 pt. Min. Either-sex	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)
1984	454, 460, 466*, 472*, 478 484, 496.	09/05 - 09/09 09/10 - 09/19	5 10	Bull Only Either-sex, (except bull only in 466, 472)*	Early Archery General
	454, 484.	12/08 - 12/31	245	Either-sex	Late Archery General
	472	11/10 - 11/18	9	Bull Only	Western Washington Muzzleloader Season
	454, 484	11/10 - 11/18	12	Either-sex	Modern Firearm General (WE)
	460, 466, 472, 478, 490.	11/07 - 11/18 11/10 - 11/18	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow A (20)	11/27 - 12/02	6	Antlerless or 3 pt. Min.	Modern Firearm Permit Only (WL or WM)
1983	None				Early Archery General
	None				Late Archery General
	None				Western Washington Muzzleloader Season

	454,484. 460, 466, 472, 478.	11/05 - 11/15 11/05 - 11/15	11 11	Either-sex bulls with visible antlers	Modern Firearm General (W)
	485 Green River Cow A (20)	11/27 - 12/02	6	Antlerless or 3 pt. Min.	Modern Firearm Permit Only (WL or WM)
1982	454,484. 460, 466, 472, 478.	11/06 - 11/16 11/06 - 11/16	11 11	Either-sex bulls with visible antlers	Modern Firearm General (W)
1981	454,484. 460, 466, 472, 478.	11/07 - 11/17 11/07 - 11/17	11 11	Either-sex bulls with visible antlers	Modern Firearm General (W)
1980	454,484. 460, 466, 472, 478.	11/09 - 11/19 11/09 - 11/19	11 11	Either-sex bulls with visible antlers	Modern Firearm General (W)
1979	454,484. 460, 466, 472, 478.	11/11 - 11/25 11/11 - 11/25	11 11	Either-sex bulls with visible antlers	Modern Firearm General
1978	454,484. 460, 466, 472, 478.	11/06 - 11/19 11/06 - 11/19	14 14	Either-sex bulls with visible antlers	Modern Firearm General
1977	454,484. 460, 466, 472, 478.	10/31 - 11/13 10/31 - 11/13	14 14	Either-sex bulls with visible antlers	Modern Firearm General
1976	478	11/25 - 11/26	2	Either-sex	Muzzleloading Rifle Season
	454, 460, 484. 460, 466, 472, 478.	11/01 - 11/14 11/01 - 11/14	14 14	Either-sex bulls with visible antlers	Modern Firearm General
1975	478	11/275 - 11/30	4	Either-sex	Muzzleloading Rifle Season
	454, 460, 484. 460, 466, 472, 478.	11/03 - 11/16 11/03 - 11/16	14 14	Either-sex bulls with visible antlers	Modern Firearm General
1974	8D	11/28 - 12/01	4	Either-sex	Muzzleloading Rifle Season
	8A 7C, 7B, 7F, 8E, 8D.	11/07 - 11/17 11/04 - 11/17	11 14	Either-sex bulls with visible antlers	Modern Firearm General
1973	Muzzleloader Area 7	12/15 - 01/31	48	Either-sex	Muzzleloading Rifle Season
	8A 7C, 7B, 7F, 8E, 8D.	11/08 - 11/18 11/05 - 11/18	11 14	Either-sex bulls with visible antlers	Modern Firearm General
	7F (50) 8D (75) 8E (50)	11/10 - 11/18 11/10 - 11/18 11/10 - 11/18	9 9 9	Either-sex Either-sex Either-sex	Either-sex Permit Controlled Seasons
1972	8A 7B,7C, 7F, 8E, 8D.	11/02 - 11/12 10/30 - 11/12 10/30 - 11/12	11 13 13	Either-sex Either-sex bulls with visible antlers	Modern Firearm General
	7F (50) 8D (50) 8E (50)	11/08 - 11/12 11/04 - 11/12 11/08 - 11/12	5 9 5	Either-sex Either-sex Either-sex	Either-sex Permit Controlled Seasons
	8A 7B,7C, 7F, 8E, 8D.	11/04 - 11/14 11/01 - 11/14 11/01 - 11/14	11 14 14	Either-sex Either-sex bulls with visible antlers	Modern Firearm General
1971	7F (50) 8D (50) 8E (50)	11/06 - 11/14 11/06 - 11/09 11/06 - 11/14	9 4 9	Either-sex Either-sex Either-sex	Either-sex Permit Controlled Seasons
	8A 7B,7C, 7F, 8E, 8D.	11/12 - 11/22 11/07 - 11/22 11/07 - 11/22	11 15 15	Either-sex Either-sex bulls with visible antlers	Modern Firearm General
	7F (50) 8E (50)	11/07 - 11/22 11/07 - 11/22	15 15	Either-sex Either-sex	Either-sex Permit Controlled Seasons

APPENDIX G Management Authority and Strategies For Controlling Elk Damage

RCW 77.36.005

Findings.

The legislature finds that:

(1) As the number of people in the state grows and wildlife habitat is altered, people will encounter wildlife more frequently. As a result, conflicts between humans and wildlife will also increase. Wildlife is a public resource of significant value to the people of the state and the responsibility to minimize and resolve these conflicts is shared by all citizens of the state.

(2) In particular, the state recognizes the importance of commercial agricultural and horticultural crop production and the value of healthy deer and elk populations, which can damage such crops. The legislature further finds that damage prevention is key to maintaining healthy deer and elk populations, wildlife-related recreational opportunities, and commercially productive agricultural and horticultural crops, and that the state, participants in wildlife recreation, and private landowners and tenants share the responsibility for damage prevention. Toward this end, the legislature encourages landowners and tenants to contribute through their land management practices to healthy wildlife populations and to provide access for related recreation. It is in the best interests of the state for the department of fish and wildlife to respond quickly to wildlife damage complaints and to work with these landowners and tenants to

minimize and/or prevent damages and conflicts while maintaining deer and elk populations for enjoyment by all citizens of the state.

*(3) A timely and simplified process for resolving claims for damages caused by deer and elk for commercial agricultural or horticultural products is beneficial to the claimant and the state.
[1996 c 54 § 1.]*

RCW 77.36.010

Definitions.

Unless otherwise specified, the following definitions apply throughout this chapter:

(1) "Crop" means a commercially raised horticultural and/or agricultural product and includes growing or harvested product but does not include livestock. For the purposes of this chapter all parts of horticultural trees shall be considered a crop and shall be eligible for claims.

(2) "Emergency" means an unforeseen circumstance beyond the control of the landowner or tenant that presents a real and immediate threat to crops, domestic animals, or fowl.

*(3) "Immediate family member" means spouse, brother, sister, grandparent, parent, child, or grandchild.
[1996 c 54 § 2.]*

RCW 77.36.020

Game damage control -- Special hunt.

The department shall work closely with landowners and tenants suffering game damage problems to control damage without killing the animals when practical, to increase the harvest of damage-causing animals in hunting seasons, and to kill the animals when no other practical means of damage control is feasible.

*If the department receives recurring complaints regarding property being damaged as described in this section or RCW 77.36.030 from the owner or tenant of real property, or receives such complaints from several such owners or tenants in a locale, the commission shall consider conducting a special hunt or special hunts to reduce the potential for such damage.
[1996 c 54 § 3.]*

RCW 77.36.030

Trapping or killing wildlife causing damage -- Emergency situations.

(1) Subject to the following limitations and conditions, the owner, the owner's immediate family member, the owner's documented employee, or a tenant of real property may trap or kill on that property, without the licenses required under RCW 77.32.010 or authorization from the director under RCW 77.12.240, wild animals or wild birds that are damaging crops, domestic animals, or fowl:

(a) Threatened or endangered species shall not be hunted, trapped, or killed;

(b) Except in an emergency situation, deer, elk, and protected wildlife shall not be killed without a permit issued and conditioned by the director or the director's designee. In an emergency, the department may give verbal permission followed by written permission to trap or kill any deer, elk, or protected wildlife that is damaging crops, domestic animals, or fowl; and

(c) On privately owned cattle ranching lands, the land owner or lessee may declare an emergency only when the department has not responded within forty-eight hours after having been contacted by the land owner or lessee regarding damage caused by wild animals or wild birds. In such an emergency, the owner or lessee may trap or kill any deer, elk, or other protected wildlife that is causing the damage but deer and elk may only be killed if such lands were open to public hunting during the previous hunting season, or the closure to public hunting was coordinated with the department to protect property and livestock.

(2) Except for coyotes and Columbian ground squirrels, wildlife trapped or killed under this section remain the property of the state, and the person trapping or killing the wildlife shall notify the department immediately. The department shall dispose of wildlife so taken within three days of receiving such a notification and in a manner determined by the director to be in the best interest of the state.

[1996 c 54 § 4.]

RCW 77.36.040

Payment of claims for damages -- Procedure -- Limitations.

(1) Pursuant to this section, the director or the director's designee may distribute money appropriated to pay claims for damages to crops caused by wild deer or elk in an amount of up to ten thousand dollars per claim. Damages payable under this section are limited to the value of such commercially raised horticultural or agricultural crops, whether growing or harvested, and shall be paid only to the owner of the crop at the time of damage, without assignment. Damages shall not include damage to other real or personal property including other vegetation or animals, damages caused by animals other than wild deer or elk, lost profits, consequential damages, or any other damages whatsoever. These damages shall comprise the exclusive remedy for claims against the state for damages caused by wildlife.

(2) The director may adopt rules for the form of affidavits or proof to be provided in claims under this section. The director may adopt rules to specify the time and method of assessing damage. The burden of proving damages shall be on the claimant. Payment of claims shall remain subject to the other conditions and limits of this chapter.

(3) If funds are limited, payments of claims shall be prioritized in the order that the claims are received. No claim may be processed if:

(a) The claimant did not notify the department within ten days of discovery of the damage. If the claimant intends to take steps that prevent determination of damages, such as harvest of damaged crops, then the claimant shall notify the department as soon as reasonably possible after discovery so that the department has an opportunity to document the damage and take steps to prevent additional damage; or

(b) The claimant did not present a complete, written claim within sixty days after the damage, or

the last day of damaging if the damage was of a continuing nature.

(4) The director or the director's designee may examine and assess the damage upon notice. The department and claimant may agree to an assessment of damages by a neutral person or persons knowledgeable in horticultural or agricultural practices. The department and claimant shall share equally in the costs of such third party examination and assessment of damage.

(5) There shall be no payment for damages if:

(a) The crops are on lands leased from any public agency;

(b) The landowner or claimant failed to use or maintain applicable damage prevention materials or methods furnished by the department, or failed to comply with a wildlife damage prevention agreement under RCW 77.12.260;

(c) The director has expended all funds appropriated for payment of such claims for the current fiscal year; or

(d) The damages are covered by insurance. The claimant shall notify the department at the time of claim of insurance coverage in the manner required by the director. Insurance coverage shall cover all damages prior to any payment under this chapter.

(6) When there is a determination of claim by the director or the director's designee pursuant to this section, the claimant has sixty days to accept the claim or it is deemed rejected.

[1996 c 54 § 5.]

RCW 77.36.050

Claimant refusal -- Excessive claims.

If the claimant does not accept the director's decision under RCW 77.36.040, or if the claim exceeds ten thousand dollars, then the claim may be filed with the office of risk management under RCW 4.92.040(5). The office of risk management shall recommend to the legislature whether the claim should be paid. If the legislature approves the claim, the director shall pay it from moneys appropriated for that purpose. No funds shall be expended for damages under this chapter except as appropriated by the legislature.

[1996 c 54 § 6.]

RCW 77.36.060

Claim refused -- Posted property.

The director may refuse to consider and pay claims of persons who have posted the property against hunting or who have not allowed public hunting during the season prior to the occurrence of the damages.

[1996 c 54 § 7.]

RCW 77.36.070

Limit on total claims from wildlife fund per fiscal year.

The department may pay no more than one hundred twenty thousand dollars per fiscal year from the wildlife fund for claims under RCW 77.36.040 and for assessment costs and compromise of claims. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW 77.36.040 and the damage occurred in a place where the opportunity to hunt was not restricted or prohibited by a county, municipality, or other public entity during the season prior to the occurrence of the damage.

[1996 c 54 § 8.]

RCW 77.36.080

Limit on total claims from general fund per fiscal year -- Emergency exceptions.

(1) The department may pay no more than thirty thousand dollars per fiscal year from the general fund for claims under RCW 77.36.040 and for assessment costs and compromise of claims unless the legislature declares an emergency. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW 77.36.040 and the damage occurred in a place where the opportunity to hunt was restricted or prohibited by a county, municipality, or other public entity during the season prior to the occurrence of the damage.

(2) The legislature may declare an emergency, defined for the purposes of this section as any happening arising from weather, other natural conditions, or fire that causes unusually great damage to commercially raised agricultural or horticultural crops by deer or elk. In an emergency, the department may pay as much as may be subsequently appropriated, in addition to the funds authorized under subsection (1) of this section, for claims under RCW 77.36.040 and for assessment and compromise of claims. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW 77.36.040 and the department has expended all funds authorized under RCW 77.36.070 or subsection (1) of this section.

[1996 c 54 § 9.]

APPENDIX H RMEF Funded Projects in the North Rainier Elk Herd Area.

Year	Project	RMEF Funding	Cooperator	Project Funding
1990	Kapowsin Winter Range Enhancement (seeding)	\$4,000.00	Champion	\$26,977.00
1991	Pack Forest Habitat Improvement	\$4,000.00	U of W	\$9,930.00
1992	Greenwater Drainage Road Rehabilitation	\$3,750.00	Mt. Baker/ Snoqualmie NF	\$7,550.00
1994	White River Elk Viewing Signs	\$2,700.00	Mt. Baker/ Snoqualmie NF	\$4,200.00
1996	Kapowsin Population Estimate Study	\$0.00	WDFW, Champion	\$6,230.00
1997	Green River Elk Calf Mortality Study	\$4,500.00	Army Corps of Engineers, WDFW	\$56,382.00
1998	Green River Elk Population Study	\$10,000.00	WDFW, Plum Creek	\$35,000.00
	Total	\$26,250.00		\$142,069.00

STATE OF WASHINGTON

GARY LOCKE, GOVERNOR

DEPARTMENT OF FISH AND WILDLIFE
JEFF KOENINGS, PH. D., DIRECTOR

WILDLIFE PROGRAM
DAVE BRITTELL, ASSISTANT DIRECTOR

GAME DIVISION
DAVE WARE, MANAGER

This Program Receives Federal Aid in Wildlife Restoration funds.
Project W-00-R, Category A, Project 1

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Washington State Elk Herd Plan

NORTH RAINIER ELK HERD

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